The Effect Of Extrinsic Reward On Sport Performance, Perceived Competence And Intrinsic Motivation

Whan Bong Choi

This thesis is presented in fulfilment of the requirements of the degree of Doctor of Philosophy.

Department of Physical Education and Recreation
Faculty of Human Development

Victoria University Of Technology

March, 1996

Abstract

The role of performance in the extrinsic rewards (ER) and intrinsic motivation (IM) relationship was examined. Four studies (N_1=93?, N_2=20, N_3=20, N_4=80) refined Intrinsic Motivation Inventory (IMI; Ryan, 1982?) internal consistency with Australian adolescents. In main study one, 147 male (n=73) and female (n=74) Melbourne schoolchildren aged 13 (n=69) and 16 (n=78) performed 20 basketball free throws on three occasions, completing the IMI after occasion 1 performance, a single-item perceived competence (PC) measure, and the IMI before and after occasion 2 and 3 performance. Before occasion 2 performance, half the males and females from each age group were offered, with controlling instructions, 50 cents for every additional basket scored; controls were offered no reward, nor was either group on occasion 3. Analysis of Variance (ANOVA) revealed that older children, males, and rewarded children performed better than controls. Significant interaction effects ($p<0.05$) indicated that occasion 2 and 3 performance ($F(2,278)=94.52$, $p<0.0001$), PC ($F(3,417)=10.67$, $p<0.001$), and IM ($F(4,556)=16.54$, $p<0.001$),improved for the rewarded group. LISREL path anaysis indicated that ER significantly influenced occasion 2 and 3 performance, PC, and IM, but the LISREL model was not a good fit. In main study two, 159 male (n=78) and female (n=81) Melbourne schoolchildren aged 13 (n=79) and 16 (n=80), completed 20 free throws, PC, and IM measures on three occasions. Before occasion 2 performance, half the males and females from each age group were told they were performing in the top ten per cent. No feedback was given to either group on occasion 3. ANOVA revealed significant age and feedback condition main effects. A significant two-way interaction revealed superior occasion 2

and 3 performance (F (2,302)=34.28,p<0.001), and IM (F (2,302)=36.50,p<0001), with positive feedback. LISREL indicated that feedback was significantly related to performance and IM. Extrinsic motivation (monetary rewards, positive feedback) can enhance performance, and intrinsic motivation.

Acknowledgments

Many people have contributed to the production of this thesis. To those I do not have space to mention I give my gratitude. Others must be individually thanked for their support.

I wish to thank Dr. Tony Morris, my principal supervisor, for his professional guidance and the enormous amount of patience he has shown me. Without his extensive knowledge and continuous efforts, my thesis would not have been completed.

I would also like to acknowledge Prof. David Lawson, Dean of Faculty of Human Development, whose generous support through the donation of a scholarship has helped in the completion of my thesis. I would like to express my thanks to Assoc Prof. Terry Seedsman, Head of the Department of Physical Education and Recreation, who provided me with sufficient facilities to be able to complete my thesis.

I would particularly like to thank Dr. Neil Diamond, consultant in statistics, who has helped me to increase my knowledge of statistics and techniques. His support has been invaluable as the analysis required became ever more sophisticated. I am also very grateful to Dr. Vance Tammen, for giving me the latest information from his area of expertise, which is closely related to my thesis topic. I would like to express my appreciation to Dr. Terry Roberts, my co-supervisor for much of the thesis and sometime Research and Graduate studies coordinator for the Physical Education and Recreation Department, who provided me with administrative guidance and direction, especially when things were uncertain.

I would also like to thank the administrative staff in the Department of Physical Education and Recreation, CRESS and the Faculty of Human Development who have also helped with various issues. This includes Karen Seidel-Davies, Dom Rechichi, Elise Downes, Anne Hicks. My gratitude also goes to the teacher and students of the Braybrook secondary school, Footscray secondary school, Melton secondary school, Maribyrnong secondary school and Strathfield secondary school, without whose involvement I would have had no participants in my studies.

Lastly, I also want to thank my family for patiently waiting for my study to be completed. Long years of study away from my family have been difficult. Especially, my wife, Jae Suk Lee, has continued to encourage me through my years of study. I also thank my children, In Young, Sun Young, and One Heak, seong Heak, twin boys born this year, who have waited patiently for me to finish my study. It has been very hard for us to be apart for so long. I hope they will all feel at least some of the pride which I have in a thesis, which is, I am sure, a worthwhile contribution to knowledge in sport psychology.

Table of contents

Table

List Of Figures.

Chapter 1: Introduction To The Study Of Extrinsic Rewards, Performance And Intrinsic Motivation

1.1 The Nature Of Motivation

Motivation is of considerable importance in many spheres of life - in the classroom, in the workplace and in overall living. Much effort and research has been devoted to the area of motivation, and the maximising of human performance. Coaches and physical education teachers are constantly seeking to understand and apply the principles involved in motivation. Recently, many researchers have been specifically involved in trying to explain the effects of reward on sports motivation and performance (Kamal, 1989; Ryan, 1977, 1980; Vallerand, 1987; Vallerand & Reid, 1984, 1988).

Many types of motivation are noted in the literature. This thesis will discuss and report on intrinsic and extrinsic motivation. Intrinsic motivation revolves around factors such as curiosity, intellectual satisfaction, challenge, and participating for the sake of doing the activity. In contrast, extrinsic motivation is based on external incentives such as financial reward, praise or the attainment of trophies or medals.

1.2. Theoretical Conception Of The Relationship Extrinsic Rewards And Intrinsic Motivation

Atkinson (1964) in his approach-avoidance (need for achievement/fear of failure) theory of motivation notes the importance of the effect of extrinsic rewards on motivation. He states that extrinsic rewards contribute to the enhancement of performance in the short term. Overall, Atkinson advocates a balanced combination of extrinsic rewards and intrinsic motivation for total motivation. This conception, that total motivation is a combination of intrinsic motivation and extrinsic motivation has been called the Additive Principle.

Deci (1975), on the other hand, suggests that extrinsic motivation may, in the long term, decrease subjects' intrinsic motivation for a task. In other words, a person's long term interest in an enjoyable task may be decreased by the introduction of extrinsic rewards. Kelley (1971) proposed the Discounting Principle, which operates to explain one's own behaviour by accepting the most readily available explanation in the circumstances. In the extrinsic reward-intrinsic motivation context it can function to reduce intrinsic motivation. Thus, when behaviour occurs in the presence of reward, the reward becomes a very clear reason for performing the activity and intrinsic motivation could be discounted because reward tends to take precedence as a reason for action. Lepper, Greene and Nisbett (1973) introduced the hypothesis of overjustification to explain this negative effect of extrinsic reward on intrinsic motivation. This proposes that where a person already has sufficient intrinsic motivation to undertake an activity, the use of extrinsic rewards may decrease intrinsic motivation because the extrinsic motivation is then seen as adequate justification for performing the task and all or some of the intrinsic motivation is redundant as a reason for performance. While research frequently supported the Discounting Principle, Foster and Hammer (1975) in their studies, did not find an overjustification effect.

To explain these previously equivocal findings, Deci (1975) proposed that extrinsic rewards can effect intrinsic motivation in two ways. The Cognitive Evaluation Theory posits a controlling aspect and an informational aspect of reward. If the controlling aspect of the extrinsic reward is dominant, Deci proposed that subjects perceive themselves to be performing to obtain the extrinsic rewards, with the result of a decrease in self-determination and intrinsic motivation.

If the informational aspect of the extrinsic rewards is more pronounced, Deci stated that subjects feel greater competence because the extrinsic reward is perceived to provide positive information, and the increase in perceived competence leads to increased intrinsic motivation. Overall, it is the individuals' perception of extrinsic reward which is the determining factor in how they will respond.

1.3. Extrinsic Rewards, Performance And Intrinsic Motivation

With respect to learning, theorists maintain that extrinsic rewards given for specific behaviour will contribute to the perpetuation of that behaviour, even after the termination of rewards (Dornbush, 1965; Goyen & Lyle, 1971; Schunk, 1983). Whilst many coaches administer extrinsic rewards to athletes to increase their motivation and their performance, the long term effects of such practices are questionable. For instance, Lepper and Greene (1975) and Swann and Pittman (1977) argue that to use extrinsic rewards to motivate student's will, in the long term, result in a decrease in intrinsic motivation. When the extrinsic reward is terminated, people will then reduce their level of participation or stop playing completely. These researchers contend that longer lasting involvement and effort in the task will be attained by the feeling of fulfilment, self-expression and self-determination associated with intrinsic motivation thereby inspiring the person to higher levels of performance.

Although research considering the effect of rewards on performance is vast, and research on the relationship between rewards and intrinsic motivation is substantial, very little research exists linking intrinsic motivation to athletic performance. This is especially so in the long term and extrinsic motivation is common in sport. Although extrinsic rewards may reduce one aspect of intrinsic motivation, such as self-determination, this need not result in a total decrease in intrinsic motivation. Increased performance could result from the promise or presentation of a reward, and superior performance could be perceived to be a signal reflecting competence and consequently, intrinsic motivation.

Intrinsic motivation is affected by both rewards and performance. For instance, rewards may act as an incentive, thereby increasing performance. In turn positive performance will enhance one's perceived competence, leading to an increase in intrinsic motivation. In contrast, the belief that one's performance is ineffective diminishes intrinsic motivation. In conclusion, rewards which enhance performance may also increase intrinsic motivation. Whilst it is recognised that extrinsic rewards do not appear necessarily destructive to intrinsic motivation, but can be negative if the rewards are perceived to be controlling behaviour, a great deal more research is required into all these factors and their effects on causal relationships, in order to determine definitive guidelines.

1.4 The Effect of Age And Gender on Intrinsic Motivation

Various theories and suggestions have been put forward regarding the relationship between age, gender and intrinsic motivation. Weiss and Brendemeir (1985) and Thomas and Tennant (1978) suggested motivation in sport is closely dependent on people's age. In 1980, Ryan (1980) reported that scholarships raised the level of motivation of female college students, while the opposite was true with the males. Deci (1972) claimed that positive feedback increased intrinsic motivation among male college students, whereas it decreased intrinsic motivation among the females. On the contrary, Blanck, Reis and Jackson (1984) and Vallerand and Reid (1988) denied such a difference, arguing that since the 1970s the feminist movement has changed women's social outlook. The effect of reward on performance, perceived competence and intrinsic motivation are currently not well understood.

1.5. The Present Thesis

This research will investigate the nature of the causal relationships between extrinsic motivation, intrinsic motivation, and sport performance in both the short and the longer term. In addition, the research will evaluate the effects of age and gender on the relationship between extrinsic reward and intrinsic motivation. An increased understanding of these relationships will benefit physical education teaching, sports coaching and administration by offering practical guidance on the most sophisticated implementation of extrinsic rewards, including the manner in which they are presented to the subject.

Chapter 2: Review Of Literature

2.1. Introduction

This chapter focuses on the definition and theory of the factors which have a direct influence on this research. The measurement of intrinsic motivation and the relationship between extrinsic reward, intrinsic motivation, perceived competence and performance for sport are reviewed. In addition, previous research on the causal relationship between extrinsic reward, performance, perceived competence and intrinsic motivation are reviewed.

A number of important questions relating to this area are addressed in this thesis, including the effect of extrinsic rewards on intrinsic motivation for different ages and gender, the influence of different rewards contingencies, the effect of monetary and verbal feedback on performance, perceived competence, and intrinsic motivation. In this present work, investigation also has been made on the long term effect of extrinsic rewards on intrinsic motivation.

The conceptualisation of this thesis occurred during 1990 and 1991 and all the empirical work was conducted during 1991-1993, with statistical analyses and completion of the thesis during late 1993 to mid 1995. The literature in the field continues to develop and new theoretical conceptions, measurement devices and empirical work have emerged. The main purpose of the literature review is to show how the proposed research was developed, drawing upon knowledge in the field. That is, the field as it existed when the research was devised. It is, thus, proposed to consider literature for the period from-1992-1995 only insofar as it relates directly to the present thesis. Recognition of the way in which new conceptual developments, measuring instruments and research based on what might constitute valuable alternative approaches will be deferred to the discussion chapter (Chapter 8) to facilitate the clarity and integrity of the argument in the literature review.

2.2. Definitions.

It is necessary to conceptualise a working definition of intrinsic motivation and extrinsic motivation in order to provide a basis for the research undertaken in this thesis.

2.2.1. Intrinsic Motivation.

Some theories of intrinsic motivation relate to the need for an optimum level of psychological incongruity in cognitive structure. Hebb (1955) postulated that organisms have a need for optimal arousal responses in order to maintain behaviour. On the other hand, Festinger's (1957) cognitive-dissonance theory contends that people are motivated to reduce all incongruity between stimuli. Berlyne (1966) viewed the human being as an information-processing system that uses information from the environment to make choices because the organism needs to compare stimuli from the environment in order to note differences and similarities. He referred to this process as collation, wherein people judge on the basis of novelty or incongruity. Other theorists have conceptualised intrinsic motivation in terms of needs and affects that are psychological rather than physiological in nature. Woodworth (1958) proposed that behaviour is generally aimed at producing an effect on the environment. According to this view, the human being has a need to have an effect in interactions with the environment. White (1959) viewed the need for effectiveness as a basic motivational property to produce non-drive based behaviours. He referred to the factors involved in this activity as effectance motivation, and a feeling of efficacy.

Maslow (1970) suggested that the various motivating factors for human beings were arranged in accordance with a hierarchy of needs. These range from biological needs to psychological needs. For instance, biological needs refer to the need for the basics of life (food, water, oxygen), whereas the psychological needs include the need for knowledge, beauty, and the necessity to have meaningful goals. Several aspects of Maslow's hierarchy of needs are closely related to intrinsic motivation. These concern self-actualisation the need to fulfil potential and the need to possess meaningful goals. Also, the factor of esteem is vital to intrinsic motivation, reflecting a subject's needs for confidence, sense of worth, competence, and self-esteem. Once basic needs are quenched, higher needs, such as intrinsic motivation, can be approached

The idea that intrinsically motivated behaviour results from a desire to achieve personal causation was proposed by de Charms (1968). He used Heider's (1958) concept of perceived locus of causality. "Whenever a person experiences himself to be the locus of causality for his own behaviour, he will consider himself to be intrinsically motivated. Conversely, when a person perceives the locus of causality to be external to himself, he will consider himself to be extrinsically motivated." (de Charms, 1968 p. 328). Izard (1977) summarised that interest and excitement are the bases of intrinsically motivated behaviour, playing an important role in the persistence of behaviour and the direction of attention. However, this suggests that intrinsic motivation is generated under specific conditions in which the most important factor is optimal challenge. This entails the individual's involvement being neither lower than, nor greatly above capacity. It seems that under optimal challenge intrinsically motivated behaviour produces feeling of competence, interest and enjoyment.

Deci (1975) defined intrinsic motivation as the need for perceived competence and self-determination, based on White's (1959) conception of effectance motivation and de Charms (1968) view's self-determination. When individuals are free from drive and emotion, they try to do something to reduce discrepancy between an internal standard and an environmental situation. Perceived competence is a person's ability to effectively deal with one's situation. Thus, people seek challenges which test their ability and they constantly try to conquer optimal challenges. The positive feeling experienced in such activity is derived from the perception of internal causality. Deci (1975), Deci and Ryan (1980, 1985, 1989, 1991) also defined intrinsic motivation as the natural experience of interest in and enjoyment of the activity in the absence of rewards. Self-determination is necessary for the development of intrinsic motivation because it enables people to achieve that feeling of internal causality.

Weinberg's (1984) describes intrinsic motivation in sport as occuring when a person is motivated for an activity without receiving any external reward, that is, "when he or she just plays for the pure fun and enjoyment associated with the activity." (Weinberg, 1984, p. 178) This definition says nothing about the underlying processes, making it difficult to generate testable hypotheses about how intrinsic motivation is likely to be increased or decreased.

Harter (1981a) suggested that intrinsic motivation is composed of preference, challenge, curiosity, and independent mastery. She used these factors to create subscales in her intrinsic versus extrinsic motivation questionnaire for children (Harter, 1981b). The emphasis on individual choice, based on interest or preference makes it unlikely that intrinsic motivation will be generated in situations where control or reinforcement are the cause for action. Intrinsically motivated behaviour is, therefore, seen to be based on the need for self-determination.

In summary, based on biologically oriented theories, intrinsic motivation is explained in terms of the reduction of unpleasant feelings or incongruity; by contrast, psychological theories focus on the need for competence and self-determination, interest and enjoyment, or challenge. The locus of causality for behaviour is perceived to be internal and positively oriented as opposed to reducing a negative state. In order to define intrinsic motivation for research purposes, the present study refers to intrinsic motivation as defined by Deci (1975). Deci proposed that intrinsic motivation is the need to feel competent and find satisfaction in doing an activity despite the absence of external reward. This feeling of satisfaction is greatly influenced by self-determination.

2.2.2. Extrinsic Motivation

The external aspects of motivation which emanate outside of an individual and are not subject to one's preference are termed extrinsic motivation. Lepper, Greene and Nisbett (1973) defined extrinsic motivation as "causes present in the environment" (p.336). Individuals' behaviour is attributed to the outside influences which motivate them to participate in an activity. When a person perceives the locus of causality to be external to themself, then they consider themself as being externally motivated (de Charms, 1968). Weinberg (1984) proposed that extrinsic motivation implies that participation is controlled by external forces such as money, trophies, grades. Weinberg further proposed if these factors were withdrawn, the individual would stop participating or participate at a reduced level.

Deci (1975) suggested that when the activity is undertaken, at least partly, for the purpose of acquiring a tangible salient reward at the completion, then extrinsic motivation is present. Brewer, Dunn and Olszewsiu (1988) suggested that extrinsic motivation indicates the external aspect of motivation which is generated outside the individual and which is not under the individual's volitional control. White (1959) viewed extrinsic motivation as a means to do a task or activity totally for the external reward. Deci (1975) suggested that extrinsic motivation occurs whenever people identify an external factor in the environment, for example, money, a prize, praise or a trophy which may constitute a highly plausible external cause for participating in the activity. Deci & Ryan (1985) and Ryan, Connel & Crolnick (1990) have proposed three different definition of extrinsic motivation based on lower to higher levels of self-determination. External regulation refers to behaviour that is controlled by external factors, such as material reward or a deadline imposed by others. Introjection refers to behavior which is reinforced through internal pressure such as a guilty or anxiety when people are not best informed by any reason. Identification is regarded as behaviours about which individuals think something is important, therefore they do something out of choice. This three definitions of extrinsic motivation has been recently proposed to distinguish from general extrinsic motivation. However, this definition has rarely been used in research. Extrinsic motivation can be summed up as motivation which does not come from an internal locus of causality. Thus, behaviour is controlled by external factors which implies an instrumental relationship between behavioural results and desired outcomes. In other words, the individual behaves in a certain way because he expects something in return for his behaviour.

2.2.3. Perceived Competence

The definition of perceived competence is important because intrinsic motivation is based, in part, on perceived competence. Several theorists have attempted to define perceived competence with different conceptions. The nature of perceived competence was first explained by White (1959) who suggested that perceived competence develops when individuals come to the understanding that they can deal effectively with the situation. When such feelings of being able to deal effectively with the situation are experienced, people tend to continue the activity. Perceived competence is influenced mainly by learning, which helps the individual develop an effective and competent way of interacting with the environment. Perceived competence exists when subjects are more or less in control of the activity, satisfying the intrinsic need to effectively deal with a certain situation. Thus, White's work established the idea that perceived competence is an antecedent of intrinsic motivation. Other researchers like Hunt (1963) and Piaget (1952) have proposed the same idea, except that each had a minor variation from White's proposition. According to Hunt, the perceived competence motivating factor is processing of information. He suggested that lack of congruity in dealing with the environment makes individuals seek congruity. Hunt, therefore, emphasised that perceived competence is the motivating factor for performance rather than one's actual competence at the activity itself. In contrast, when Piaget examined the development of competence, he concluded that competence occurs naturally when subjects interact with the environment. The process called accommodation occurs when subjects develop various structures to assist them in interaction with the environment. The use of certain cognitive structures enables the person to integrate the information contained in the environment and this process Piaget called assimilation.

In conclusion, intrinsic motivation is strongly dependent on one's perceived competence in effectively dealing with the present environment as well as a strong self-determination in the performance of a specific task. Both perceived competence and self-determination are self-perceived and can thus be influenced by factors which affect perception, such as expectation and defence mechanisms. Nevertheless, a person's perception of their competence and self-determination in any situation will often be based largely on the information and degree of control, which is available in that situation.

2.3. Theories

A number of theories have been proposed to explain the relationship between intrinsic motivation and extrinsic reward. People are extrinsically motivated to perform an activity when they expect a tangible reward such as money, a prize, a trophy, or when they receive praise such as positive verbal feedback. According to Atkinson (1964) the relationship between intrinsic motivation and extrinsic reward is additive in nature. Reiss and Sushinksy (1975) were of the view that extrinsic reward causes distraction rather than decreasing intrinsic motivation. Greene and Lepper (1975) suggested that extrinsic reward overjustifies previous intrinsic motivation, therefore decreasing intrinsic motivation. According to Deci (1975), there are two functions of rewards, namely the controlling and informational aspects which explain the effect of extrinsic reward on intrinsic motivation. Halliwell (1979) posits the view that perceived salience of the controlling and informational aspects causes either increase or decrease in intrinsic motivation. These approaches are now considered in more detail.

2.3.1. Atkinson - Additive Principle

Achievement motivation theory (Atkinson 1964) proposed that achievement motivation was divided into two factors the need to achieve success and avoid failure. This works was based on the achievement motivation theory of McClelland, Atkinson, Clark, and Lowell (1953); the need to achieve success (nAch) and the need to avoid failure or fear of failure (FoF). According to Atkinson's formula, an individual's total achievement motivation is explained by the need to achieve minus the need to avoid failure. He used a projective test of the Thematic Apperception Test (Murray, 1943) to measure nAch and the Test Anxiety Scale to measure FOF, and maintained that individuals who show a higher level of the need to avoid failure than need to achieve success would be less likely to enter into achievement situations. That is, they have negative achievement motivation. Individuals who have a higher need to achieve success than need to avoid failure in achievement situations would more likely participate in achievement situations. That is, they possess positive achievement motivation. The relationship between intrinsic motivation and extrinsic reward is additive, that is, extrinsic reward adds to the level of achievement motivation in order to produce total motivation in a given situation. In fact, Atkinson proposed that extrinsic rewards are needed to lure into an achievement situation any person whose motive to avoid failure is greater than his or her motive to succeed. Late research showed that extrinsic reward reduced intrinsic motivation and thus, overall motivation made this theory untenable (e.g., Lepper & Greene, 1973).

2.3.2. Competing Response Theory

Competing response theory (Reiss & Sushinsky, 1976) states that competing responses are detrimental to responses that promote task enjoyment. The offering of extrinsic reward could cause many reactions that compete with responses that facilitate task enjoyment. Performing the task in a more interesting way compared to the previous task experience leads to increased intrinsic motivation whereas performing the task in a less interesting way relative to previous experience impairs subsequent intrinsic motivation. This theory suggests that when extrinsic reward is given for involvement in an enjoyable activity it causes potential distraction. Therefore, subjects tend to be distracted from the enjoyable task, but do not lose intrinsic motivation for the activity. This distraction may be in the form of performance anxiety, stimulus novelty effects, the urge to finish quickly to get the reward or cognitive distraction. Reiss and Sushinsky (1976) suggested that in a single trial extrinsic reward decreased intrinsic motivation, but extrinsic rewards with a multiple-trial approach did not decrease intrinsic motivation. Research on this theory (Reiss and Sushinsky, 1975) indicated that when rewards symbolised success, contingent reward administered using a multiple rewards procedure enhanced intrinsic motivation. The reason is because multiple reward made the subject feel more competent internally.

2.3.3. Discounting Principle And Overjustification

The Discounting Principle refers to the effect on intrinsic motivation of offering extrinsic rewards for doing the activity. For example, a boy plays cricket and is rewarded for this activity which can be described as a fun activity where a reward is not required. The rewards decrease the value of the cricket game to the boy, with the ultimate result that the boy stops playing cricket if the rewards are removed. Thus, extrinsic reward decreases intrinsic motivation, and this is called the Discounting Principle. According to the Discounting Principle (Kelley), if one reason for an individual's behaviour is salient another reason will be discounted. Following on the Discounting Principle, Greene and Lepper's (1975) concept of overjustification conception holds that people's intrinsic motivation may be decreased by inducing them to participate in an otherwise intrinsically interesting activity in order to receive extrinsic rewards. Because the extrinsic reward provides a very clear justification for undertaking the activity, intrinsic motivation becomes an overjustification and is reduced as a consequence. This interpretation can be contrasted to Atkinson's (1964) Additive Principle. In one study (Greene & Lepper 1974), nursery school children were induced to draw with a marker in order to win a prize. Those who were initially promised and given a prize for their drawing activity engaged in it less during the free play period than did children who had neither been promised nor awarded a prize. Thus, the reward overjustified the previous enjoyable activity, and the children discounted their previously level of interest. Therefore, intrinsic motivation was decreased by the extrinsic reward. Research which demonstrated that under certain circumstances an extrinsic reward led to an increase in intrinsic motivation (e.g., Deci, Cascio & Krusell, 1973), brought this explanation into question.

2.3.3. Cognitive Evaluation Theory

Deci (1975) noted that on some occasions research showed an additive effect of extrinsic reward (e.g., Deci, Cascio & Krusell, 1975), but on other occasions it showed a discounting effect (e.g, Lepper & Greene, 1974). The existing theories predicted one or the other, based on mechanistic processes. Deci (1975) developed a theory which allowed for either outcome, based on the individual's perception of the reward. Cognitive Evaluation Theory (Deci, 1975) predicts that intrinsic motivation is a function of the degree of perceived competence and self-determination that are created by the interaction between an extrinsic reward and subjects' self-perception. Intrinsic motivation is increased or decreased by the individual's perception of two aspects of extrinsic reward: the controlling aspect and the informational aspect.

The implications of cognitive evaluation theory are important for understanding motivation in sport because sports are not only based on intrinsic motivation but also involve the frequent use of extrinsic rewards. Deci and Ryan (1985) elaborated three propositions for understanding intrinsic motivation. The first proposition refers to people's intrinsic need to be self-determining in terms of the perceived locus of causality. An external perceived locus of causality decreases intrinsic motivation and controls behaviour whereas an internal perceived locus of causality increases intrinsic motivation and promotes autonomy.

> "External events relevant to the initiation or regulation of behaviour will affect a person's intrinsic motivation to the event that they influence the perceived locus of causality for that behaviour. Events that promote a more external perceived locus of causality will undermine intrinsic motivation, whereas those that promote a more internal perceived locus of causality will enhance intrinsic motivation." (Deci & Ryan, 1985, p. 62)

The second proposition relates to people's intrinsic need to be competent in dealing with the environment and to conquer optimal challenges. Perceived competence is increased by success and receiving positive feedback and with feeling self-determinating regarding the activity. Intrinsic motivation is associated with perceived competence. Diminished perceived competence leads to decreased intrinsic motivation whereas increased perceived competence promotes intrinsic motivation depending on how subjects feel in the activity.

> " External events will affect a person's intrinsic motivation for an optimally challenging activity to the extent that they influence the person's perceived competence, within the context of some self-determination. Events that promote greater perceived competence will enhance intrinsic motivation, whereas those that diminish perceived competence will decrease intrinsic motivation" (Deci & Ryan, 1985, p. 63)

The third proposition relates to the fact that initiation or regulation of behaviour have informational, controlling, and amotivating aspects. The level of salience of each of the three aspects to an individual affects perceived causality and perceived competence, and it changes intrinsic motivation.

> "Events relevant to the initiation and regulation of behaviour have three potential aspects, each with a functional significance. The informational aspect facilitates an internal perceived locus of causality and perceived competence, thus enhancing intrinsic motivation. The controlling aspect facilitates an external perceived locus of causality, thus undermining intrinsic motivation and promoting extrinsic compliance or defiance. The amotivating aspect facilitates perceived incompetence, thus undermining intrinsic motivation and promoting amotivation. The relative salience of these three aspects to a person determines the functional significance of the event." (Deci & Ryan, 1985, p. 64).

While Deci and Ryan's (1985) treatment of CET refers to the notion of optimal challenge, little research has actually examined performance tasks or the effect of performance in such optimally challenging tasks as an influence on the relationship between extrinsic rewards, and perceived competence and intrinsic motivation. This thesis focuses on the role of performance as a mediator between rewards on the one hand and perceptions of competence and intrinsic motivation on the other.

2.3.3.1. Controlling aspect of reward.

When people perceive a change from internal to external causality of their behaviour as a consequence of being given an extrinsic reward, and hence a reduction in self-determination, intrinsic motivation decreases. This is referred to as the controlling aspect of cognitive evaluation theory. People are intrinsically motivated initially to do the activity but once an extrinsic reward is given to them, the reason to act changes from internal to external, thereby decreasing self-determination. Individuals attribute their behaviour to an external factor. Consequently, intrinsically motivated behaviour tends to be reduced when reward is no longer available. Although less common, the converse is also true; where a reward made an individual feel more self-determining, intrinsic motivation would increase.

2.3.3.2. Informational aspect of reward.

When extrinsic rewards provide a person with positive information, they enhance perceived competence, thus increasing intrinsic motivation. When the information is negative and implies lack of competence, however, intrinsic motivation decreases. These positive and negative effects on perceived competence and self-determination are attributed to the informational aspect of cognitive evaluation, according to the theory.

For example, a positive informational aspect occurs when people perceive they have competence in performing an activity thereby increasing intrinsic motivation. On the other hand, a negative informational aspect occurs when people perceive incompetence, that is they do not achieve the desired result, thereby decreasing intrinsic motivation.

2.3.3.3. Salience.

Halliwell (1978) reinforced Deci's (1975) proposition that it is not the real strength or nature of the extrinsic reward but perceived salience of the controlling and informational aspect that causes either increase or decrease in intrinsic motivation. Cognitive-evaluation theory could be better understood if the following three important aspects are grasped. First, the processes by which extrinsic rewards can affect intrinsic motivation involve a change in perceived locus of causality and change in subjects' feelings of competence. Second, each reward has two factors, a controlling aspect and an informational aspect, and it is the relative importance of these aspects which governs the process that will be initiated. Third, and probably the most outstanding feature, is that it is not the salience of the reward itself, but the perceived salience of the controlling or informational aspects of the reward which mediates the effects of extrinsic rewards on intrinsic motivation. Thus, Cognitive Evaluation Theory is a cognitive phenomenological approach to the understanding of motivation.

In conclusion the additive principle is the sum of intrinsic motivation and extrinsic reward equal to total motivation. Other, theories however, suggest that it is incorrect to add intrinsic motivation and extrinsic rewards because extrinsic rewards may decrease intrinsic motivation. Competing Response Theory suggested that when a reward is given for a single trial it decreases intrinsic motivation, whereas multiple trial extrinsic rewards does not decrease intrinsic motivation. This theory, however, ignores the ability of perception to re-evaluate the effect of extrinsic reward on intrinsic motivation. The Discounting Principle and Overjustification Hypotheses suggested that extrinsic rewards decrease intrinsic motivation by overjustifying the previous enjoyable activity and discounting the previous level of interest. This theory does not lay much emphasis on development of perceived competence in dealing with an activity. Cognitive Evaluation Theory clearly explains the effects of extrinsic reward on intrinsic motivation in two ways, namely the controlling aspect and the informational aspect of rewards. This theory, however, fails to focus on the level of performance and its effect on intrinsic motivation. Different theoretical propositions suggest similar predictions for why extrinsic rewards decrease intrinsic motivation. It appears, however, that the above theories have not explained in detail the reason for extrinsic rewards decreasing intrinsic motivation. In the area of sports, Cognitive Evaluation Theory (Deci 1975; Deci & Ryan, 1980, 1985) is most frequently used in interpreting the effect of reward on intrinsic motivation. The focus on cognitive processes which can lead to different resolutions in terms of intrinsic motivation has been a strength of this approach, making it consistent with current perspectives in psychology. An attraction of this theory in sport is its focus on perceived competence and self-determination. This theory suggests that perceived competence is closely related to self-determination and both perceived competence and self-determination are fundamental aspects of intrinsic motivation. It is important to note that a sense of competence through the individual's perception of the level of performance is likely be a crucial factor in determining intrinsic motivation. A careful analysis of the motivational context in sport activity and its relevance to the level of performance needs to be done to fully explain this complex relationship.

2.4. Measurement of Intrinsic Motivation

A vital issue in research on intrinsic motivation is the manner in which it is measured. There are two kinds of measurement of intrinsic motivation. One is that based on free choice behaviour, that is, how much subjects spend their time on the activity without perceivable extrinsic rewards and when behaviour is open to free choice. This measure was derived from the definition of intrinsic motivation based on free choice or self-determination in the absence of extrinsic rewards and was used in many of the early studies where controlled environments were set up. For example, Deci (1971, 1972b) applied the free choice behaviour measurement in puzzle solving. The second technique for measuring intrinsic motivation used by some researchers is the questionnaire approach. For instance, Mayo's (1976) Task Reaction Questionnaire was designed to assess intrinsic motivation on the stabilometer task. Ryan and colleagues (Plant & Ryan 1985; Ryan, Mims & Koestner, 1983) have developed a multidimensional measure of feelings relating to the task. They discussed and assessed various items and subscales. The resulting questionnaire was later called the Intrinsic Motivation Inventory (IMI) by other workers in the field. It is composed of five subscales; Interest and Enjoyment, Perceived Competence, Effort and Importance, Perceived Choice, and Pressure-Tension. The following section describe and assess these two approaches to the measurement of intrinsic motivation.

2.4.1. Behavioural Measurement (Free Choice And No Reward)

Early in the history of research on the effect of extrinsic rewards on intrinsic motivation, measurement of intrinsic motivation was typically behavioural in nature

(Deci, 1971, 1972b; Lepper & Greene, 1975). People were said to be intrinsically motivated, if they participated in the activity in the absence of perceivable extrinsic rewards or constraints. The basis of free choice measurement of intrinsic motivation is how much subjects spend their time on the activity, which is a useful note of the subjects' affective reaction to the activity. Measurement by this method has involved surreptitiously observing subjects' behaviour during the free choice period in an interesting task without any extrinsic reason for doing it, such as positive reinforcement, praise, money, prize or social approval. However, Deci and Ryan (1985) noted that the measurement of intrinsic motivation becomes very complicated in situations where motivation is governed by internal pressures, needs, feelings and expectations which can all alter the way humans behave and perform.

In a number of studies, free choice measurement has been used as the measure of intrinsic motivation (Deci, 1971; 1972a, 1972b; Greene & Lepper, 1975; Lepper & Greene, 1974). Experiments related to this approach were mostly executed in non-sport settings. However, Orlick and Mosher (1978) used this approach to test 11 year old subjects on the stabilometer, an interesting motor activity which evaluated body balance. Nevertheless, the stabilometer is a laboratory, not a real world sport competition, so control of the environment is possible.

The free choice technique has its shortcomings. This method needs careful manipulation of the experimental procedure because if the subjects know that they are being observed, then their intrinsic motivation usually appears to be greater, whereas in reality, they are trying harder because they are being watched. Here intrinsic motivation can be confused with other external variables. Another shortcoming in the method is that it is unsuitable for most sporting events because sports take place in an uncontrolled dynamic environment. For example, most sport set time during play have no time to behaviour their action in free choice time. Also, in competitive sport there is usually a large extrinsic motivation component like praise, trophies or money.

Therefore, it is almost impossible to measure intrinsic motivation in this environment. Finally, the free choice method makes comparison between studies difficult because the attraction of the experimental activity is reactive to the attentive available.

2.4.2. Questionnaire Measurement of Intrinsic Motivation.

An alternative method to measure intrinsic motivation is the questionnaire method based on Deci's definition (1975) of perceived competence and self-determination. Questionnaires for measuring intrinsic motivation have been developed. These include the Task Reaction Questionnaire (TRQ) developed by Mayo (1976), and the Intrinsic Motivation Inventory (IMI) developed by Ryan (1982). McAuley, Duncan and Tammen (1989) modified the IMI by extending it to the sports domain. Using White's concept on effectance motivation based on perceived competence in dealing with the environment, Harter (1981) developed a self report scale which measured subjects (grade 3-9) intrinsic versus extrinsic orientation towards learning and mastery in the classroom. Weiss, Bredemier and Shewchuk (1985) modified Harter's (1981b) method by focusing on the sports domain. The nature and use of these questionnaires is now considered in some detail.

2.4.2.1. Mayo's Task Reaction Questionnaire (TRQ)

Mayo's (1976) Task Reaction Questionnaire (TRQ) was developed to measure intrinsic motivation for a cognitive task, namely the SOMA puzzle.. This measure contains items addressing task interest, feeling of achievement, feeling of being challenged, and motive for participating in the activity. The questionnaire consists of 23 items which indicate intrinsic motivation and extrinsic motivation, each item has a range on a 1 to 7 point scale. The range of the TRQ is 23 to 161 points. This questionnaire reveals high internal consistency with r=.93, (Mayo, 1976), .r=95 (Pretty & Seligman, 1984) . Fisher (1978) also found this test to be highly reliable (r=.96). Using split-half reliability tests, Vallerand and Brawley (1983) compared the results of the TRQ to a free choice measure and derived the same result. However, this research has not tested the factor structure using confirmatory factor analysis to estimate the fit of the data to a hypothesised model of the structure. Markland (1993) suggested classification in seven subscales, namely perceived competence, choice, effort, interest, enjoyment and excitement, achievement, social comparison and fear of failure. Although the Task Reaction Questionnaire has been shown to possess acceptable reliability and validity for measuring intrinsic motivation for a specific task which requires physical balance. The stabilometer task is usually of short duration, whereas many real sports activities require a much longer period of sustained motivation. Besides, sport activity depends on multiple cognitive assessment. The TRQ was used by Vallerand and Reid, (1984, 1988) in relation to motivation in the sport area and by Lopez (1981) in relation to the general working situation.

2.4.2.2. Harter's Intrinsic - Extrinsic Orientation Questionnaire

Harter (1981a) described a self report measure to assess intrinsic motivation versus extrinsic motivation in primary school children with regard to classroom learning. Harter developed a 30 item scale for measuring intrinsic versus extrinsic motivational orientation in the classroom, consisting of five dimensions, with six questions in each subscale. The five scales investigated, challenge, interest, mastery, independent judgement and criteria of success and failure. Further analysis of the five dimensions indicated two underling factors. The first three dimensions comprised a motivational value factor (challenge, interest and mastery), whereas the remaining two dimensions made up a cognitive-informational value factor (independent judgement and success and failure). The questions which indicate intrinsic motivation were written in one column, whereas those which depict extrinsic motivation were written in another column. Subjects were given scaled boxes to tick by which they expressed their responses.

The aim of the measure was to establish the developmental trend that occurs from extrinsic motivation to intrinsic motivation. Contrary to expectation, in the first cluster, the students moved from intrinsic motivation to extrinsic motivation. Harter suggested that this could be a reflection of the school system or that the students were adopting the relevant school culture which reinforced the extrinsic motivation trend. However, in the cognitive-informational cluster students moved from extrinsic motivation to intrinsic motivation. Harter concluded that motivational factors are related to situations and are not trait dependent. This study is valuable because it examined developmental shifts and suggested that motivational factors are situation specific. A major hypothesis of Harter's study was that intrinsic motivation is related to perceived competence. Higher perceived competence is related to higher intrinsic motivation. The results of the study, according to Harter, supported the hypothesis.

The main weakness in Harter's (1981b) IEOQ is that the format of the questionnaire is misleading and the statement for differentiating intrinsic motivation and extrinsic motivation is difficult for grade 3 - 9 children because the gradings of items on the subscale are too condensed. As such it is difficult to obtain a clear picture of intrinsic motivation. The age of subjects to whom the questionnaire can be administered is limited to grade 3 - 9. This scale focused mainly on the learning and mastery aspect of motivation in the classroom which is different from the atmosphere in the sports area.

<u>2.4.2.3. Weiss, Bredemeier and Shewchuk's Intrinsic/Extrinsic Motivation Scale for the Youth Sport Setting.</u>

Weiss, Bredemeier and Shewchuk (1985) developed a scale to measure intrinsic/extrinsic motivation for use in the sport setting by rewording Harter's (1981) measure of motivational orientation. This scale was applied to a particular program in which the subjects were focused on skill development, cooperation with peers, and on developing a positive attitude toward physical activity. Weiss et al. used third to six grade boys and girls as subjects and the questionnaire consisted of the total 30 items from Harter's IEOQ with 6 items for each of five subscales. Weiss et al. used both an exploratory factor analysis and a confirmatory factor analysis to test the fit of the sport motivation data to the original five factor structural model identified by Harter for the motivation questionnaire. In the modified scale it appears that the sample came from a special sports program, which is different from a general group, and thus the scales is more likely to measure social psychological factors associated with participants rather than cognitive assessment which depends on the level of performance in a dynamic situation.

2.4.2.4. Ryan's (1982) Intrinsic Motivation Inventory

The Intrinsic Motivation Inventory (IMI) was created and developed by Ryan, Mims and Koestner (1983) and extended by Ryan and Plant (1985). They developed the Intrinsic Motivation Inventory (IMI), based on Deci and Ryan (1980, 1985) definition, suggesting that perceived competence and self-determination are the central part of intrinsic motivation. This questionnaire consists of 27 items which have rarely been used. McAuley, Duncan and Tammen (1989) suggest that the inclusion or exclusion of any one factor fails to adversely affect the remaining factors. This questionnaire consisted of a seven-point Likert-type scale. Subjects were asked to respond to how much they perceived each subscale, ranging from whether they strongly agree or strongly disagree. There are five subscales; perceived competence, interest-enjoyment, effort-importance, pressure-tension and perceived choice. They used questionnaire without perceived choice subscale.

2.4.2.5. McAuley, Duncan and Tammen's IMI.

The Intrinsic Motivation Inventory (IMI) developed by Ryan and his colleagues (1985) was modified for use in a competitive basketball shooting game involving American university students by McAuley, Duncan, and Tammen (1989). The revised IMI consisted of four subscales which are interest-enjoyment, perceived competence, effort-importance and tension-pressure. Perceived choice was omitted because subjects had no choice about the task or when they did it. A basketball free throw shooting game was used for assessing psychometric properties of the Intrinsic Motivation Inventory. McAuley et al. noted that Ryan had claimed that either addition or removal at any one subscale does not detrimentally influence the rest of the subscales, and all the 27 items have rarely been used. They also suggested that any subscale could be made shorter to choose the desirable items without seriously changing the original reliability and it is possible to easily modify the end of each item for measuring intrinsic motivation in various tasks. McAuley et al. reported that the internal consistency of the overall scale reflected an alpha coefficient of (r=.85), indicating adequate reliability. They also compared 18 items with 16 items for measuring the fit to a model between four first order factors and one second order factor in the hierarchical model for general intrinsic motivation. Results indicated that the ratio of chi-square to degrees of freedom was 2.5, indicating a tenable value, according to the authors.

2.4.2.6. Free choice versus questionnaire measure for intrinsic motivation.

In the literature, intrinsic motivation has been measured mainly by free choice and questionnaire measures. Free choice measurement is based on the premise that intrinsic motivation is rooted in the participant's involvement in an activity solely for self-gratification, not due to any extrinsic reward. Researchers have rarely used this method in the sport area. Many researchers have preferred to use the free choice method in non sport areas such as puzzle game or drawing. Free choice measures do not provide a direct assessment of intrinsic motivation. Rather intrinsic motivation is inferred from beheviour and there could be other motivational factors that affect behaviour. Another major flaw in free choice measures is that subjects tend to change their perception and behaviour when they know they are being observed. It is possible that when reward is given, subjects tend to work hard. As a consequence which they feel tired, resulting in a decrease in intrinsic motivation. Therefore, this measure needs to be carefully organised by the experimenter.

Different researchers have different criteria on what free-choice behaviour may determine intrinsic motivation. For example, Deci (1971, 1972a, 1972b) and Lepper and his colleagues (1973, 1976) employed the length of time the subject freely spent on the task in the absence of reward. Arnold (1976) and Farr (1976) measured intrinsic motivation in terms of degree of willingness to take part in future activities. Philps and Lord (1980) evaluated intrinsic motivation through the level of performance. Thus, it appears that the free choice measure focuses on the whole picture, not on specific segments, in determining intrinsic motivation. As a consequence, validity and reliability of the free choice measure can be questionable. It is also difficult to use in real sport contexts, because these do not naturally offer choices under controlled conditions.

The alternative measure of intrinsic motivation is the questionnaire measure which is based on White's (1959) competence theory and Deci's (1975) self-determination theory. Thus, intrinsic motivation is determined by measuring such factors as perceived competence and self-determination, interest and enjoyment. This method have been used by McAuley et al. (1989), and Whitehead and Corbin (1991) who have employed the with IMI, whereas Vallerand (1983), and Vallerand and Reid (1984, 1988) used the TRQ in the sport field. The operational definition of intrinsic motivation in this case is more flexible than in the free-choice measure. Moreover, the questionnaire approach enables the researcher to measure the degree or level of the motivation factor. Also, it is easier to test the validity and reliability of the questionnaires as well as obtain and analyse data.

In conclusion, the use of either the free choice measure or the questionnaire measure depends on the situation or purpose of the study. It appears that the free choice measure may not be suitable to measure intrinsic motivation in the context of the present thesis. The definition of intrinsic motivation in this thesis is based on perceived competence and self-determination, as well as interest and enjoyment. The activity itself has no time limit and there is no naturally occuring way to measure directly the behaviour of subjects in reaction to the reward. Thus questionnaire measurement appears to be more suitable for this present thesis.

2.5. Research

In this section the past research is reviewed in order to consider the effect of extrinsic reward on intrinsic motivation. Extrinsic reward is also frequently used to motivate people to improve performance. The issue of reward contingency plays a crucial role in interpreting the results relating to the relationship between extrinsic reward and intrinsic motivation. Several investigators, however, have explored the issue of contingency. Results were inconclusive as different definitions produced different results until Ryan, Mims and Koestner (1983) gave a consistent interpretation based on clear definitions of reward contingency. The issue of performance is very important in the sports area, but there is no detailed analysis to interpret the effect of performance on intrinsic motivation. It has been found that important factors which influence sports participation are enjoyment, sense of personal achievement, challenge and affiliation in sum called intrinsic motivation (Alderman & Wood, 1976; Wankel & Kreisel, 1982; Wankel & Pabich, 1982).

Vallerand and Reid (1984, 1988) tested the role of perceived competence in relation to intrinsic motivation and found that an increase in perceived competence tends to increase intrinsic motivation, especially when the competence is identified through verbal feedback. It has been argued, consistent with cognitive evaluation theory, that perceived competence is a mediating factor between extrinsic rewards and intrinsic motivation. Verbal feedback, rather than tangible reward is most frequently used to encourage and motivate athletes. As such, it is necessary to review the role of verbal feedback in relation to performance and intrinsic motivation. Though different age groups and genders react differently to the issue of extrinsic reward, there has not been a detailed study of this issue. Despite work such as Harter (1986a) the role of gender and developmental aspect in the relationship between intrinsic motivation and extrinsic motivation and the influence of age in the crucial adolescents years has not been investigated. Thus, the present review provides ample scope for analysing the relationship between extrinsic reward and intrinsic motivation, exploring the relationship between extrinsic rewards and performance, considering the issue of reward contingency, and examining the relationship between intrinsic motivation and performance. The review also assesses the relationship between extrinsic reward, perceived competence and intrinsic motivation; between verbal feedback, perceived competence and intrinsic motivation; between verbal feedback and performance; and lastly, the effect of age and gender and their relationship with intrinsic motivation.

2.5.1. Extrinsic Rewards And Intrinsic Motivation

Extrinsic rewards such as praise, trophies and money are frequently used in sport events and school classes to encourage individuals largely based on the additive principle. Atkinson (1964) proposed that extrinsic reward could help to promote more motivation in the activity. Learning theorists have asserted that when extrinsic rewards are administered to influence the performance of a specific behaviour, it will increase the likelihood of that behaviour persisting even after rewards have been terminated (Dornbush 1965; Goyen & Lyle,1971; Schunk 1983). From this it has been inferred that intrinsic motivation has increased. Deci (1971a) examined the effect of extrinsic monetary reward on intrinsic motivation with college students by using intrinsically interesting block puzzles (SOMA) in three one-hour sessions. Intrinsic motivation was measured by free choice behaviour. At the end of each session in this study, subjects were asked to complete a questionnaire, ratig on 1 to 9 point scale, the interest and enjoyment for task. In the second session, the subjects were divided into two groups: a group who received task contingent rewards of money ($ 1 per puzzle solved) and a control group. Each group consisted of 12 subjects. In the third session, with no reward for either group, the experimenter left the subjects alone with alternative amusements such as magazines set up on a table and secretly observed their behaviour. This study found that the reward group showed a decrease in intrinsic motivation from session 1 to session 3, whereas there was no evidence of such a decrease in the control group. Following this, a field experiment (Deci, 1971a) was conducted using 2 groups of four males, total eights undergraduates. Again there was a reward group and a control group. The subjects were required to write headlines and performance was measured by the average time need in writing each headline. That is, a short time needed in writing a headline was interpreted as indicative of strong intrinsic motivation. In the same manner, longer time needed to write the headlines indicated lesser intrinsic motivation. The reward group was paid for the first three weeks of a 12 week period. There was no significant change in the time taken by the reward group over the 12 weeks but the control group showed a notably improved performance.

In a third study, Deci (1971a) investigated the effect of verbal feedback (positive and no feedback) on intrinisic motivation by using an interesting SOMA puzzle game. In the first session subjects were taught to play the game. In the second session the positive feedback group were told that their score was better than the average for the puzzle game. When the subjects did not solve the puzzle, they were told that it was the most difficult one and that most people were unable to solve it, so they had not played badly. After both the groups played the puzzle in the third session, neither the positive feedback group nor control group received any feedback. In order to test whether the puzzle is of interest or enjoyable to the subjects, they designed a nine-point questionnaire that measured the various levels of interest and enjoyment of the activity. The average for this level was 7.42 to 8.25. Results revealed that the positive feedback group displayed no decrease in the time spent on the puzzle over the three sessions, whereas the no feedback group showed a consistent decrease in the amount of time spent on the puzzle over the three sessions. The limitation of this study is that subjects came from different backgrounds (a mixture of technical and art students) which may have produced different results.

Deci conducted three consecutive studies in order to examine the effect of extrinsic rewards on puzzle and news headline writing. There were some limitation; These studies did not report performance because the ability of subjects may affect intrinsic motivation. It is also possible that competence of improved performance may affect intrinsic motivation. The number of subjects who participated in this study was quite small, that is, 24 subjects for the first and third study, and only eight for second study. Also, the subjects of third study came from different backgrounds. For instance, one group was from mechanical science; the other participants were art students. This difference in background may affect the subjects' reaction to the task.

Lepper and Greene (1974) investigated the overjustification effect on intrinsic motivation with 4-year-old children in a nursery school. They participated in a picture drawing activity. Children who displayed high interest in the activity were selected for further study. These children were assigned to one of three groups: the expected-reward group were promised a certificate with a gold seal and ribbon just for participating in the activity. In the unexpected reward group, children only received a reward after participating in the activity with no mention of a reward beforehand. The no reward group participated without any mention of a reward at any stage and no reward was given. After two weeks of baseline observation, the experimental period was conducted over three consecutive days. The data collected during free choice time periods revealed that children in the expected reward group showed a significant decrease in intrinsic motivation. In both the unexpected reward and no reward group there was a minor increase in intrinsic motivation but it was not statistically significant. The results of this study contradict the Additive Principle, supporting a

Discounting Principle interpretation of the relationship between extrinsic rewards and intrinsic motivation.

Deci, Cascio and Krusell (1975) examined the effect of different type of performance feedback on intrinsic motivation. Results demonstrated that positive feedback increased the intrinsic motivation of males, whereas positive feedback decreased the intrinsic motivation of females. Negative feedback decreased intrinsic motivation for males and females. This result may indicate that traditional sex role socialisation of males and females produces different effects on intrinsic motivation. That is, males appear to more achievement-oriented, while females tend to be less achievement-oriented and more socially conscious.

Using simulated games Arnold (1976) investigated the effects of extrinsic rewards on intrinsic motivation in 53 undergraduate students over three sessions. Arnold measured return behaviour of subjects (both actual return and volunteering to return) feelings of competency, satisfaction, enjoyment and task performance. The design allowed for each group to be rewarded at each session. All subjects in group one received \$2 after session 1, subjects in group 2 received \$2 after session 2, and subjects in group 3 received \$2 after session 3. At the end of the game in each session the subjects were asked to fill out a questionnaire consisting of four 7 point scales. They were asked subjects to rate their degree of enjoyment, satisfaction, feeling of competence and degree of interest in returning to play again. Results revealed that when Group 1 was rewarded, the return rate was 77% for session 2 whereas in the absence of reward for Groups 2 and 3 at the same session, the return rate was 53%, indicating that intrinsic motivation of subjects who were rewarded during session 1 was significantly ($p<0.05$) higher than that for the no reward groups namely Groups 2 and 3. In the second session only Group 2 was rewarded. Results showed that for the rewarded group (2) the return rate was 37% for session 3, but for groups 1 and 3 the no reward groups in the same session (2) the return rate was 55%

for session 3, indicating that intrinsic motivation of subjects in the no reward group was higher than intrinsic motivation of subjects in the reward group. However, statistically, the difference was not significant (z=-0.73, p.0.05). An alternative measure, namely the questionnaire method, was used by Arnold to indicate satisfaction, enjoyment, and volunteering as measures of level of intrinsic motivation. The questionnaire (satisfaction and enjoyment of task) revealed no consistent pattern of significant difference between reward and no reward subjects. Results also indicated that rate of volunteering to return and actual return were not consistent. Volunteering appeared to be an inflated indication of strength of intrinsic motivation as measured by subsequent behaviour. Therefore precaution should be taken in interpreting volunteering as an indicator of level of intrinsic motivation. Arnold also tested whether feedback from task performance had a significant effect on perceived competence and intrinsic motivation by using multiple regression. Results showed that five performance independent variables together accounted for 45% of the variance in subjects' reported feelings of competence on the task. Extrinsic reward, however, accounted for less than 1% of the variance. The amount of variance accounted for by 6 variables (5 independent variables and extrinsic reward) was highly significant. Perceived competence of subjects who returned a second time to perform the task was higher than perceived competence of subjects who did not return for sessions 2 and 3. A difference in the same direction was observed at the end of session 2, though the difference was not statistically significant ($p>0.05$). Results indicated that when intrinsic motivation for a task is high, extrinsic reward either maintains or slightly increase intrinsic motivation. In conclusion it appears that feedback from the task had an effect on perceived competence on the task, whereas extrinsic reward (money) did not influence perceived competence in the task. Perceived competence was an important factor influencing intrinsic motivation to perform the task again in the future. The main flaw of this study was that it consisted of a small sample in each Group, especially for session 3. In addition, the questionnaire used in this study is not validated. The analysis of data in groups 2 and

3 was not separated. This research especially emphasised that feedback from performance is a potent influence on perceived competence and intrinsic motivation as an informational aspect of reward.

Research conducted by Lopez (1981) studied the effect of extrinsic reward for performance on intrinsic motivation with female telephone operators by using attendance, tardiness, productivity ticket accuracy and tone of service recorded by the operator's supervisor. The Task Reaction Questionnaire (TRQ; Mayo, 1976) was used for measuring intrinsic motivation. On the first occasion subjects were asked to complete the TRQ questionnaire one month before the reward program started. At the time of this first test the subjects were not aware that an incentive program would be introduced. The same questionnaire was completed three months after introduction of an incentive program. The incentive program was aimed at improving performance through a $50 gift to the best operator each month. The result of a t-test showed a significant ($p<.01$) increase in intrinsic motivation, perceived personal control over performance, feedback from the job and performance rating after the performance contingent reward was implemented. The result of the stepwise multiple regression analysis showed that 32% of the variance in intrinsic motivation was explained by change in perception of personal control over performance and 46% of the variance was explained by feedback from the job. Performance contingent reward, therefore had a positive effect on performance, intrinsic motivation and perception of personal control over performance. In turn, increase in intrinsic motivation lead to a feeling of internal control over performance and perception of feedback from the job. Lopez (1981) also suggests subjects should have greater intrinsic interest in the task due to the offering of extrinsic rewards for performance. Limitations of this study include the fact that there was no control group and the problem of the definition of reward contingency . In particular, contingency is problematic because the nature of reward in this study was competitively contingent, that is, if one operator received it, others could not (Ryan, Mims and Koestner, 1983). The Questionnaire (Task Reaction

Questionnaire, Mayo, 1976) may not suitable for this study because TRQ was designed for use with a stabilometer task.

A study was conducted on female university students by Rosenfield, Folger and Alderman (1980), in order to test the overjustification hypothesis using the intrinsically interesting cross word "Ad-lib" game. The subjects were first divided into four groups: monetary reward with competence feedback, monetary reward without competence feedback, noncontingent monetary reward without feedback, and no reward with competence feedback. After practising the task with instructions, subjects played the game for eight minutes, and then subjects were rewarded differently according to high and low competence in the task. The subjects with high competence in the contingent reward group, consisting of the top 15%, were highly paid and the subjects with low competence, consisting of the bottom 15%, were low paid. The 15% of the subjects who showed greater than average activity in the no pay and competence feedback group were highly paid and the bottom 15% were low paid. Of the subjects in the contingent reward with no feedback group, 15% were highly paid and 15% were lowly paid at random. In the subjects in the noncontingent reward with no feedback group, 15% were highly paid and 15% lowly paid at random. Following the pay manipulations the choice of participation was left entirely to the subjects. According to Rosenfield, Folger, and Aldelman (1980) when subjects freely choose to participate in an activity, extrinsic reward generally tends to decrease intrinsic motivation. Subjects were then asked to play for 15 minutes consequent to agreement, subjects were asked to fill out a questionnaire both on task enjoyment evaluation and rate of return for future play. On completion of the questionnaire, subjects were given a free choice time of 3 minutes when the experimenter went to collect credit forms and then subjects' behaviour was recorded by another experimenter. Results revealed that highly paid subjects in the contingent reward with competence feedback group showed more willingness to return for a future game, displayed more liking for the task, and spent more free time on the task than low pay subjects in the contingent reward with competence feedback group. Subjects with competence feedback in the absence of pay showed the same result as the contingent reward and competence feedback group. Also the subjects in the contingent without competence feedback and subjects in the noncontingent reward without competence feedback groups were also compared. Results revealed that low pay subjects in both groups were more willing to return for a future game, displayed more liking for the task, and spent more free time on the task than high pay subjects. A comparison of the no competence feedback conditions both with contingent and noncontingent reward showed that low pay subjects in the contingent reward without competence feedback group and low pay subjects in the noncontingent reward with no competence feedback group showed more willingness to return for a future game, displayed more liking for the task, and spent more free time on the task than high paid subjects with no feedback regardless of contingent reward. This study showed that subjects viewed their rate of pay based on their competence in the task. When high pay was accompanied by high competence feedback subjects increased intrinsic motivation. When the rate of pay did not indicate the competence on the task, highly paid subjects decreased intrinsic motivation due to lack of competence regardless of reward contingency. In this study, contingent reward was given for level of performance, whereas noncontingent reward was given for participating irrespective of the level of performance or completion of the task. This study emphasised that the level of competence feedback is a substantial determinant of intrinsic motivation. Thus, level of competence in the task influenced intrinsic motivation more significantly than reward contingency itself. The weakness of this study was that subjects' level of interest in the task was not pretested. The award of credit for the course may have had an effect on the dependent variable. It is also difficult to generalise the results because a single gender (female) was used. Finally, the questionnaire was not examined for validity and reliability.

Karniol and Ross (1977) studied the effect of performance-relevant and performance-irrelevant rewards on the intrinsic motivation of 4 - 9 year-old children on a game involving construction of picture slides. The subjects were divided into three groups: subjects in the performance-irrelevant reward condition only participated in playing the game to receive two marshmallows; subjects in the performance-relevant reward group were told that the number of marshmallows they would be given was in proportion to the quality of their performance; and subjects in the no reward control condition were neither promised nor provided any reward. The experimenter had subjects perform a card game. Following this game, subjects were informed of no reward in the forthcoming game and then the experimenter said that she had some work to do in the backroom. This was done to create a free time period for 6 minutes for the children with alternative toys, which included thinker toys, pictures and a marble game. The amount of time they played the slide game was used as a free choice behavioural measure of subjects' intrinsic motivation. Results revealed that the performance-relevant reward and control conditions increased intrinsic motivation, whereas the performance irrelevant reward condition led to a significant decrease of intrinsic motivation. Least squares analysis of variance showed a significant difference in level of performance. The interaction indicated that both the performance-relevant reward group and the control group performed better than the performance-irrelevant group. Additional results showed that low performance reduced play for non-reward subjects but there was also a tendency for rewarded subjects to reduce play when their performance was low. Play increased in non-reward low performance subjects. In the lower performance group there was no difference between reward-relevant reward condition and control group. However, the performance irrelevant reward condition yielded less play than the two above conditions. It was revealed that males were more persistent than females, but there was no interaction effect of sex by experimental condition. No significant main effect or interaction involving age were found. One of the problems with this study is the use of marshmallows. The assumption that marshmallows are liked by all children must be questioned. Furthermore, there is no rationale for the varied age group of 4 - 9 year-olds.

Feingold and Mahoney (1975) studied the effect of extrinsic reward on intrinsic motivation with five second grade children drawing in Follow-The-Dots books and playing an Etch-A-Sketch game. Each subject was shown how to perform the activities without any preference for 15 minute sessions daily over four consecutive days. In Base line 1, each child played for 15 minutes. Both activities were available with no suggestion of which activity to perform. Data was collected over eight sessions of 15 minutes each over two weeks. In reward sessions, subjects were shown a display of rewards which could be gained by accumulating points. By performing the Dot-to-Dot exercise, subjects would score 1 point for improving their previous Baseline 1 performance, plus on extra point for each 50 extra dots joined. In Baseline 2 the Baseline 1 condition was reintroduced and subjects were told that no rewards would be given. The rewards were removed from the area. Again data was collected for 2 weeks, followed by a 2 weeks interval of no testing. After this break, in Baseline 3, a further 10 sessions of 15 minutes each were conducted with Baseline 1 conditions. Results using repeated measure ANOVA, revealed that firstly, the rewards sessions showed a dramatic increase in performance over the Baseline 1 results. Secondly, that the Baseline 2 sessions displayed an increased performance over the Baseline 1. Finally, and most importantly, that Baseline 3, results showed a further increase in performance over the Baseline 2 sessions despite a 2 week complete lay-off period. This study has strengths and weaknesses. Although the sample was small, the testing period was extensive and the retest period was lengthy allowing for the measurement of the long term effect of extrinsic reward on intrinsic motivation. Performance however was regarded as intrinsic motivation, which is problematic. Finally, there was no statistical comparison between Baseline 1 and Baseline 3. This study suggested that reward, over a longer term, affect intrinsic motivation

Ryan (1980), employing a questionnaire to determine intrinsic motivation, used Cognitive Evaluation Theory to explain the impact of an athletic scholarship on male and female undergraduate athletes. He predicted that male footballers receiving scholarships would see themselves as performing the sport for money and enjoy the sport less than non scholarship males, the rewards being interpreted as controlling. On the other hand, the female athlete receiving a scholarship would experience it as informational regarding their individual competence, because scholarships for women were a relatively new innovation at that time and only a small number of athletes received them. Thus, the rewards for the females would be interpreted as positive information and intrinsic motivation would be enhanced. The results revealed that male football players on scholarship experienced the scholarships as controlling, since they reported less intrinsic motivation for football than did non-scholarship players. With male wrestlers, however, the results were different. Because scholarships are given less frequently in wrestling and coaches emphasised that those selected were special, wrestlers apparently experienced their scholarships informationally, for they reported more intrinsic motivation for wrestling than did non-scholarship wrestlers. For similar reasons, the females on scholarship in a number of sports, showed enhanced intrinsic motivation, as predicted. In addition to providing strong support for Cognitive Evaluation Theory in a real sport context, this study suggests that it is not the fact of the reward itself that determines its impact on intrinsic motivation; rather, it is whether the controlling or informational aspect of the reward is perceived be more salient for the recipient.

Alub (1990) examined whether athletic scholarship has an impact on intrinsic motivation by comparing funded athletes and non-funded athletes in a Canadian University. Seventy college students were asked to respond to the questionnaire, consisting of six subscales indicative of intrinsic motivation, i.e. fun, time spent off season, enjoyment, interest, effort, perceived competence, and the athletes' perception of the results. The results showed that there was no difference in intrinsic motivation between funded and non-funded athletes. However, the funded athletes displayed higher perception of their own athletic ability in comparison to the non-funded athletes. Athletes funded for one year or less showed that they spent more free time in their major sport than athletes funded for more than one year. These results contradict the results of Ryan's (1979) study, suggesting that scholarship athletes displayed more extrinsic reasons for participation and reported less enjoyment of their activity than non-scholarship athletes. In a second study (Ryan, 1980), reported scholarship either increased or decreased intrinsic motivation depending on the athlete's perception of the locus of causality. This difference between Ryan (1979) and Albu (1990) findings could depend on the nature of the sport environment. As Leyshon (1984) has suggested, the Canadian view of college sport is quite different from that held in the United States. American collegiate sport involves a lot of money, and universities give priority to athletics. On the other hand, Canadian universities do not spend as much on intercollegiate sport according to Leyshon. Therefore, Canadian scholarship athletes tend to perceive their scholarship as based on their superior performance and competence, which in turn either increases or maintains intrinsic motivation. Ryan's (1980) study also affirmed this proposition in relation to female athletes and wrestlers who displayed more intrinsic motivation due to the emphasis placed on their competence as the basis for their scholarships.

Orlick and Mosher (1978) tested the impact of extrinsic rewards on intrinsic motivation for motor activity, using the standard free choice measure. They pretested children ranging in age from 9 to 11 years to assess their intrinsic motivation for the stabilometer task, an activity that involves static balancing. First, the children had a free choice pretest period. Subsequently, the children returned for more of this activity under either an expected reward condition (a trophy if they did a good job), an unexpected reward condition (where the trophy was given after the same performance, but they were not informed of this until they had completed the activity), or control group 1 (which did not receive nor expecte a reward and also did not receive positive social feedback). Control group 2 received only positive social feedback for participating in the activity. Four days later, subjects returned for a post-test assessment of intrinsic motivation, once again measured by a period of free choice activity. Results revealed that both the control groups spent more free choice time on the task, even in the absence of reward, than the subjects in the unexpected reward condition. The expected reward group, did not spend as much as the control group on the task, but spent more time in free choice activity in the absence of reward than the unexpected reward group. This is contradictory to the result of the study by Lepper and Greene (1975), who found that the expected reward group showed significantly decreased intrinsic motivation compared to the unexpected reward group. Orlick and Mosher (1978) combined the two reward groups namely, expected and unexpected reward group and compared them to the two control groups combined. They reported that the combined reward groups spent less time on the stabilometer than did the subjects in the combined control groups.

Douglus (1993) investigated how different kinds of feedback reward affect intrinsic motivation in fitness testing, based on Australian Schools Fitness Test (ASFT) among students aged 11 to 12 years. Subjects were asked to complete a 20 item version of Ryan's (1982) IMI questionnaire one week before fitness testing. This consisted of a 1.6-km run, sit ups, push ups and sit and reach, two skill tests, a 50-m run and a standing long jump. One week following the fitness testing, subjects in Group 1 were given one of three different certificates based on their performance. A gold one referred to achievement of more than 85% average, a silver one referred to 60% to 84%, and a bronze referred to 30% to 59%. Subjects in Group 2 were told that the test scores were not ready yet. Subjects in Group 3 were presented with the AFST certificate individually and with positive verbal feedback relating to their performance. After the reward, subjects were asked to complete the post test IMI. Results in the three groups showed that there was no difference between sexes, or between levels of fitness or between reward conditions on total IMI change. The high performers in Group 1, however, increased in perceived competence and intrinsic motivation, whereas low performers decreased on both variables. This indicated that reward may have provided information on competence for the subjects, which led to increased intrinsic motivation for high performers and a decrease for low performers. In addition, all subjects except the high-performing girls, were positive in relation to perceived competence and intrinsic motivation. Even this was not significant, suggesting that the feedback did not greatly decrease positive feeling for the low performers. This study suggested that the reward did not significantly affect perceived competence and intrinsic motivation. It is possible that intrinsic motivation a week before and after the fitness test might be insufficient to reflect the subjects' true perception of their ability or achievement because of the length of time between the performance and the tests. Another possibility is that the subjects were not very interested in the fitness test because of its tough physical demands as compared to other activities such as game involving skill and ability. Douglas found that Conbach alpha coefficients supported the internal consistency of the IMI subscales, with the exception of the five-item pressure-tension subscale. It was noted " with this age group of children, therefore, it appears that the concepts of anxiety, pressure and tension are not reliably measured by this scale" (1993, p. 5). Douglas did not include the pressure-tension subscale in the calculation of the IMI score which was used in the analyses. This is a general lack of clarity of the findings. It is worth noting the point made by Vallerand and Deci (1987), that the basis of intrinsic motivation in youth fitness may be different to sport intrinsic motivation and intrinsic motivation for fitness should therefore be measured using differently.

When studying the relationship between reward and intrinsic motivation, equivocal results have appeared. Increased intrinsic motivation in the rewarded group was found in some studies (Arnold, 1974.; Feingold, et al, 1975; Karniol & Ross, 1977; Lopez, 1980; Rosenfield et al., 1980), while decreased intrinsic motivation in the rewards group was shown in other research (Deci, 1971, 1972a, 1972b; Lepper & Greene, 1975). As considerable variation is evident in the research, further investigation is necessary to understand the effect of extrinsic rewards on intrinsic motivation. Particularly, it is possible that extrinsic reward tends to increase intrinsic motivation when subjects obtain positive feedback about performance, besides feedback from the task itself. On the other hand, it might be that extrinsic reward tends to decrease intrinsic motivation when subjects view extrinsic reward as a means to an end, for instance, people do something in return for the reward.

The results could differ depending upon different operational definitions of intrinsic motivation at the start, the level of intrinsic motivation, different tasks, and the method employed. In the first of Deci's experiments (1971), the results appear to indicate that a decrease in intrinsic motivation for the reward group may have occurred because subjects were satiated; in the reward period they worked hard but once the puzzle was solved they were no longer interested. Also, this study did not report any difference in performance over the reward period. In the second experiment (Deci 1972a) the time taken to write a headline was regarded as intrinsic motivation as opposed to the free time measurement in the first experiment.

The previous research on the relationship between extrinsic reward and intrinsic motivation suggests that extrinsic reward could cause a decrease in intrinsic motivation in the absence of feedback. This focuses on perceived competence in relation to the level of performance, whereas when extrinsic reward takes into account the level of performance and perceived competence derived from feedback, the effect of extrinsic reward on intrinsic motivation may be positive. According to Arnold (1975), the initial high level of intrinsic motivation of the performer may produce a different result as to the decrease in intrinsic motivation because of reward. The long-term effect of extrinsic rewards on intrinsic motivation has not been examined, except by Rosenfield, Folger, and Adelman (1980) and Feingold and Mahoney (1975). For measuring intrinsic motivation, the free choice measure or questionnaire method are most frequently used without examining their relative reliability and validity. Early research showed very little concern for the sport setting. It was Ryan (1980) who first studied the effect of extrinsic reward on intrinsic motivation for sports activity and showed that different sports produced different results. For example, footballers perceived scholarships more in terms of the controlling aspect, whereas male wrestlers perceived scholarships from the perspective of the informational aspect of the reward. Besides, different genders produced different results, so like the wrestlers, female athletes viewed scholarships in terms of the informational aspect. Therefore, in order to produce an accurate interpretation, gender and the nature of the task should be considered. In addition, a comparative analysis of the effect of extrinsic reward on intrinsic motivation between the control group and the experimental group was ignored by Flingold and Mahoney (1975), and Lopez (1981). Most importantly the extrinsic reward may maintain or increase intrinsic motivation under certain circumstances. For example, perceived competence from improved performance could mediate the controlling aspect of the extrinsic reward. It is important to note that each participant can perceive their level of competence differently.

2.5.2. Extrinsic Reward And Performance

In this section, the main theory and research literature on the effect of extrinsic reward on sport performance is reviewed. Although there is a substantial literature relating extrinsic rewards to performance, the potential of extrinsic reward to enhance performance has not been considered in research on extrinsic rewards and intrinsic motivation. Enhanced performance could have implication for intrinsic motivation, either directly or through perceived competence. From a practical perspective the relationship between extrinsic rewards and sport performance is also very important.

To elaborate on this point in more detail, consideration must be given to an earlier theory which assumes that extrinsic reward enhances performance. Skinner's (1953) theory of operant conditioning was concerned with the timing of the reward to influence a subject's response rate and the observed behaviour. This theory assumed that when extrinsic reward is provided, it will positively reinforce the organism's response. When rewards are withdrawn, response rate increases somewhat for a short time. It is as if the organism tries harder to get the reward until it learns that it is no longer available, and then response rate starts to drop off and continues to decline until it reaches the initial level; this is called extinction. In order to continue to stimulate the response, rewards are often provided to the subjects. Theoretically, a weakness exists in that there is no explanation of the longer term effect when the reward is terminated. Animals such as rats and monkeys were used in research to develop this theory, which have been not considered cognitive mechanisms which might underlie human thought and behaviour. This theory has been content with the discovery of a functional relationship between reward and behavioural performance for simple behaviours. Nonetheless, it has been assumed by many that positive reinforcement leads to increased incidence of the reinforced behaviour (performance) in humans performing work, school or sport tasks.

According to Adams' (1963) theory of equity, workers strive to achieve an equity between their job inputs and outcome and the job input/outcomes of others. For example, if workers feel overpaid relative to others with the same inputs, workers tend to increase their inputs which may increase their level of performance. Likewise, if workers believes they are underpaid relative to others with the same inputs, they tend to decrease their input thereby decreasing their level of performance. According to the Cognitive Evaluation Theory (Deci 1975), extrinsic reward may decrease performance, however, extrinsic reward can also increase performance. For example when an individual is given extrinsic rewards for excellent performance, this reward tends to directly influence perceived competence. In Cognitive Evaluation

Theory, Deci (1975) does not show much concern about the role of extrinsic reward in facilitating performance compared to the importance of extrinsic reward as an influence on intrinsic motivation.

In the view of McGraw (1978), extrinsic reward tends to decrease performance. Extrinsic reward may divert one's attention away from the activity and towards the reward. It may also cause anxiety, thereby decreasing performance. Lepper and Greene (1975) also suggested that when extrinsic motivation is given by another person it tends to produce different behavioural situations, as the performer may be uncertain about the specific behavioural requirements of the rewarder.

In terms of the sport setting, it is valuable to review research which has examined the informational aspect of performance. Thomas and Tennant (1978) studied the influence of extrinsic rewards on performance in athletic tasks. Boys aged seven and nine were divided into four groups. The contingent group were told that the better they performed the more the reward they would receive; the non-contingent group were told to do the best they could and they would receive a reward. The unexpected reward group were told to do their best but not informed of any reward until after performance. The control group were told to just play for fun. In each case subjects performed a target throwing task for 5 minutes. Thomas and Tennant (1978) found that the contingent reward group achieved significantly higher performance scores than the other groups.

Denman, Landers, and Feltz (1980) specifically investigated the effect of awarding stars for performance in throwing a velcro ball with boys aged seven and nine who were divided into three groups: contingent reward, non-contingent reward and no reward (control). Their results supported the positive effect of extrinsic rewards on performance. The contingent and non-contingent groups performed equally well, and much better than the control group. It is important to note that the task was a highly motivated and preferred skill.

A study conducted by Kamel (1989) investigated the effect of extrinsic reward and different kinds of rewards on the performance of swimmers, comparing 10 - 12 and 13 - 15 years olds. This study revealed that age and ability were highly significant factors. The interaction effect of age by ability was also found to be significant. Younger subjects produced larger variations in swimming performance than older subjects. It was also found that performance and attitude improved greatly with extrinsic reward particularly for the younger age group who were more influenced by extrinsic reward than the older subjects. Hence, students in swimming classes with extrinsic reward were more likely to participate than those students who did not receive any reward. This research concluded that preferences for rewards are age dependent and that there is a great deal of individual difference in the selection of preferred reward. The limitation of this study is that only one treatment period was used with no delayed post testing.

Schunk (1983) investigated the effect of reward on arithmetic division skill with subjects aged 9 to 11. The study tested both level and progress of the division skill. In the first session of this experiment, specifically designed to examine performance before and after the manipulation period, subjects were assessed for self-efficacy on the skill. Following the first session, the performance contingent group were told that they would be given an extrinsic reward for correctly solving each problem during the second session. The task-contingent group were informed before the second session that they would be given rewards just for a participating in this activity, and rewards were given at the end of second session. The unexpected group were not told of any reward. However, individuals this group were given 2 dollars. The research design controlled for the influence of receiving training. After pretest, the second session continued with reward, and than one day after the second session, post test was executed without reward. Prior to the third session, subjects in all groups were told that they would not receive a reward. The results showed that the performance-contingent reward subjects demonstrated significantly higher division skill than the task contingent and the no reward group, which did not differ significantly from one another. The problem-solving speed of the performance-contingent reward group was faster than the other groups. With respect to the present research, Schunk's study used the same method, which consisted of three sessions, one before the reward session, and one after the treatment experiment. One difference was that the "control" group did not received an unexpected reward at the end of session 2. The task was aversive to the subjects, which mean that extrinsic reward might have been more likely to raise performance. In this experiment feedback was not given during after the sessions.

Goyen and Lyne (1971) investigated the effect of rewards upon retarded and normal readers on a visual-associate learning task with subjects, aged 6 - 7, who were allocated to reward and no reward treatments within each of the two reading level groups. In this study the reward subjects were given one half penny per correct response but no reward for an incorrect response. After presentation of the nine paired associates in each learning trial, subjects moved on to the test trial. Results indicated that the effect of the reward treatment was significant for both the retarded and normal reader groups. Subjects rewarded in both the retarded and normal reader groups showed a greater rate of correct performance. However, this research used only a one-phase experiment, that being the period when reward was provided, and evaluated the number of correct responses in a visual-visual paired associate learning task.

Rushall and Pettinger (1969) conducted a study which was designed to examine the effects of various rewards on swimming performance with children aged 11 and 13. The subjects were assigned into four groups: the control group received no reward for performance; the candy group were given one piece of candy for each lap completed; the coaches' group received praise or comment at the end of a swimmer's performance; the Money group received one cent for each lap completed. These rewards were provided at the end of each session. The money and candy groups were informed of the consequences of their behaviour before performance. The others group were not. Results revealed that subjects rewarded with money and candy produced better performance than the coach's feedback and control groups in the swimming programs. This study only used a manipulation phase, and did not employing a pretest of performance. Rushall and Pettinger's (1969) study did not examine the longer-term effects of introducing the rewards, so it not known whether the advantage would have been maintained once rewards were removed.

Miller and Estes (1961) studied the effect of reward on performance in discrimination learning. Subjects were asked to distinguish between the line drawings of two persons. Subjects were classified into three groups, namely a 50 cent reward group, 1 cent reward which was task contingent reward for their participating in the task group and no reward group. Subjects were given 100 trials to identify the drawings. Results showed that there was no difference between the two reward groups in the number of mistakes they made. The no reward group made less errors than the two reward groups. The no reward group also exhibited more willingness to learn.

Glucksberg (1962) gave college students the task of mounting a candle on a vertical screen. Subjects were assigned to one of two group; a reward group, consisting of the top 25% were given $5, while a no reward group received no monetary reward. In addition, the best performer in the reward group was awarded $20. This is competitively contingent reward depending on how quickly subjects solve of problem. Results showed that reward subjects took a longer time to solve the problem compared to the non-reward group. In a study by Kruglanski, Freidman and

Zeevi (1971), subjects in the no reward group performed significantly better than subjects in the reward group (task contingent as free trip). Likewise, studies by McGraw and McCullers (1979a) showed that reward as task-contingent for solving a series of 10 water-jar problem, subjects consistently took a longer time to complete the task and made more errors than the no reward group.

The negative effect of reward on performance has been focussed mainly on subjects working in educational rather than sport settings. Studies generaly failed to take into account the interest of the subjects and moreover ignored the longer term effect of reward on performance. In conclusion, the negative effect of rewards on performance in the earlier studies frequently failed to distinguish between rewards contingency. They also ignored the initial level of interest and they failed to take into account competence feedback. There are very few studies relating to extrinsic reward and performance in the area of sports. However Rushall and Pettinger (1969), Kamel (1989), and Thomas and Tennant (1978) focused on the sports area particularly swimming. Results from these studies indicate that reward tended to increase performance; but the studies failed to analyse performance in the absence of reward and the longer term effects of extrinsic reward on performance. The weight of research, however, generally indicates that extrinsic motivation has a positive influence on performance. The potential for extrinsic motivation to enhance performance is important for practitioners, but it must be understood under what conditions extrinsic motivation does enhance performance to use it effectively in practice. There is some evidence that performance-contingent rewards promote an increase in performance. It is, thus, important to consider the issue of reward contingency.

2.5.3. The Issue Of Contingency

The studies dealing with the relationships between extrinsic reward and intrinsic motivation have used various terminology for the type of reward administered. The main problem with these studies is that many authors use the same term to define different types of reward which does not clearly indicate a uniform rewarding procedure. Consequently, the results of different studies appear to be inconsistent and contradictory to one another. In order to understand this aspect of rewards, the issue of reward contingency was once again reviewed and clearly analysed by Ryan, Mims, and Koestner (1983). Ryan et al. classified the types of reward into four reward contingencies, namely task-non-contingent, task-contingent, performance-contingent and competitively-contingent reward

Task-non-contingent rewards are given to subjects for taking part in the experiment, whether they perform the target activity or not. Rewards are given to a person who only participates in the activity irrespective of termination or quality of task activity. Deci (1972a) used the term-non contingent reward to refer to rewards for taking part in the experiment.

Task-contingent rewards are offered to people for actually doing the task or for completion of an activity regardless of standard of performance (Deci, 1972a; Harackiewicz, 1979; Lepper, 1973.).

Performance-contingent reward is used to indicate that a reward is given for a defined level of performance. It is necessary to make specific reference to the quality of performance or the standard for achieving the task before performance (Schunk 1983).

Competitively-contingent reward means that if one person gets the reward, the others must lose it. This type of reward contingency often has a highly detrimental effect (Pritchard, Campbell & Kampell, 1977). Consequently this type of reward causes anxiety and loss of intrinsic motivation. Some people might regard competition as an opportunity to improve one's skill, however, which would lead to a different reaction on intrinsic motivation.

In addition, Orlick and Mosher (1978) and Lepper and Greene (1974) used the terms expected and unexpected reward in research on the effect of extrinsic reward on intrinsic motivation. Expected reward can be used interchangeably with task-contingent reward. Lepper and Greene (1974) showed greater decrease in intrinsic motivation for an expected reward group than an unexpected reward group. In contrast, Orlick and Mosher (1978) showed the biggest decrease in intrinsic motivation for the unexpected reward group, while the expected reward group decreased in intrinsic motivation to a lesser extent compared to the unexpected group. It appears that the expected reward group is regarded as a task contingent reward group because reward is given to the subject for complying with the experimenter's request.

In a number of other studies (Cooper & Smith, 1974; Deci, 1972; Farr, 1976; Ross, 1975; Weiner & Mander, 1978) task-contingent reward was compared with either task-non-contingent reward or no reward. Deci (1971, 1972b) demonstrated that subjects who received task-contingent reward for completing puzzles, decreased their intrinsic motivation compared to a no rewards group. Weiner and Mander (1978) tested the difference between task-contingent and task-non-contingent reward (each 5 cents) upon subsequent performance on a decoding task. In each condition, the reward was 5 cents per item decoded. The results revealed that both rewards had a detrimental effect. However, task-contingent reward decreased intrinsic motivation more than task-non-contingent reward. They explained that subjects who received task-contingent reward are more likely to perceive reward as the reason for doing the activity. Luyten and Lens (1981) offered college students one dollar for solving a puzzle. They found that the subjects in the task-contingent reward group showed a lower level on all five dependent variables (interest, challenge, willingness to return, time spent and willingness to return in the future) than those of the no reward group. Daniel and Esser (1980) found that the extrinsic reward (competitively contingent) decreased the intrinsic motivation for high interest task and low structure whereas reward did not influence low interest task. In particular, extrinsic reward increased intrinsic motivation on highly structured tasks. Calder and Staw (1975b) compared task-contingent reward to no reward. The results revealed that task-contingent reward decreased intrinsic motivation compared to the no reward group.

Harackiewicz (1979) found that task-contingent reward with positive feedback did not affect intrinsic motivation, because positive feedback may mitigate the effect of task-contingent reward on intrinsic motivation, but task-contingent reward without feedback decreased intrinsic motivation compared to a non-reward group. When performance-contingent reward implied recognition of the ability of the subject, however, this reward increased intrinsic motivation in the arithmetic skill for children aged 8 to 11 years (Schunk, 1983).

Some researchers (Morgan, 1981; Ross, Karniol & Rothstein 1976) found that task-contingent rewards given only for participating in the activity decreased subjects' intrinsic motivation in comparison with the no reward group. However task-contingent rewards with positive feedback did not decrease intrinsic motivation. Task-non-contingent reward had no detrimental effect on intrinsic motivation which is similar to the no reward group results. This finding was supported in a study conducted by Deci (1972a), which revealed that the effect of offering task-non-contingent reward to college students for puzzle solving was not significant compared with a no reward group.

Swann and Pittman (1977) found that the effect of task-non-contingent rewards on intrinsic motivation for children did not differ from the no reward group. Pinder (1976) tested the difference between task-non-contingent and task-contingent rewards by measuring two behavioural and two attitudinal aspects of intrinsic motivation for building an electric car in male high school and college students. Pinder (1976) found that the task-non-contingent reward group showed increased intrinsic motivation whan compared to the task-contingent group. Weiner and Mander (1978) offered college females 5 cents for decoding words within a cartoon and found that task-non-contingent rewards decreased performance to a lesser extent than task contingent rewards. Task-non-contingent rewards do not seem to decrease intrinsic motivation because subjects do not attribute their interest in the activity to extrinsic reward, and they do not perceive reward to be controlling their behaviour. Therefore, the effect of task-non-contingent rewards on intrinsic motivation is similar to no reward conditions.

Performance-contingent-reward appears to be the most controlling type of reward compared to other reward contingencies. Demanding a predetermined level of performance may produce anxiety and pressure to achieve the performance requirement. Performance-contingent rewards are sometimes informational, however, because they convey the competence of the person on the task and provide positive feedback to the subjects. When subjects do not achieve the level of performance that they expected, there is likely to be a greater salience of the controlling aspect, which decreases perceived competence, and therefore, decreases intrinsic motivation according to cognitive evaluation theory. Karniol and Ross (1977) found that subjects who performed well and received a performance irrelevant reward showed decreased intrinsic motivation during a subsequent free play period compared to subjects who received performance relevant reward or no reward. Subjects in the no reward group or performance reward group decreased intrinsic motivation when told that they performed poorly. Thus, performance contingent reward is based on the level of performance, which in turn affects intrinsic motivation. Rosenfield, Folger, and Adelman (1980) found that there was no difference in intrinsic motivation between performance-contingent rewards for positive competence feedback and no reward. Harackiewicz (1979) reported that the performance-contingent reward of high school students doing a puzzle game was associated with less intrinsic motivation compared to the no reward group with positive feedback. This study on performance-contingent reward is more likely to reflect the controlling aspect because it required the subjects to achieve predetermined level of performance. Thus, performance-contingent reward decreased intrinsic motivation. Luyten and Lens (1981) contrasted performance-contingent reward with task-contingent reward, saying that subjects would receive money for each model solved faster than 50% of the subjects in their group, but they would not receive money if they did worse. Results showed that the performance-contingent reward group showed more willingness to return and paid more attention than the task contingent reward group. The difference in interest between the two groups was not significant. Performance-contingent reward based on achieving a specific level of performance could either decrease intrinsic motivation due to the controlling aspect of a specific level of performance, or increase intrinsic motivation due to the informational aspect, because subjects feel competent due to having achieved a high level of performance in the task and also for the recognition of their ability at the task. Boggiano and Rubble (1979) studied the difference between performance-contingent reward and task-contingent reward. Results showed performance-contingent reward did not decrease intrinsic motivation compared to the task-contingent reward. Performance-contingent rewards in this study meant successful performance with age groups 3 - 5 and 9 - 11 years old in the hidden picture game, whereas task-contingent reward was based only on being prepared to participate in the task. It appears that the detrimental effect of reward on intrinsic motivation was mitigated by positive feedback and competence on the task.

In brief, task-non-contingent rewards appear to decrease intrinsic motivation to a lesser extent relative to task-continent rewards. Performance-contingent rewards do not appear to decrease intrinsic motivation when subjects demonstrate competence or increase competence on the task. Any detrimental effect of performance-contingent reward seems to be reduced to some extent when performance-contingent reward enables subjects to achieve a specific requirement. When performance-contingent reward ignores the level of competence in performing the activity, it is likely to lead to reduction in intrinsic motivation. The effects of the different forms of reward contingency on intrinsic motivation also depend on a number of determinants which affect intrinsic motivation such as the nature of the task, level of intrinsic motivation, subjects' perception, personality, feedback and competence. Moreover, researchers have used different terms without consistent definitions, and this makes results look more inconsistent. Further clarification of the reward contingency issue is need, especially with respect to performance-contingent rewards, probably the most widely used form of contingency.

2.5.4. Intrinsic Motivation And Performance

The literature on the relationship between intrinsic motivation and sport performance does not give any clear indication as to whether the level of intrinsic motivation increases, maintains stability, or decreases performance. Teachers, coaches, athletes and sport psychologists assume that intrinsic motivation has a strong effect on sport performance and other leisure activities. McGlaw and McCullers (1978) reviewed the literature indicating that intrinsic motivation is closely related to performance of creative activity, conceptualising and learning; intrinsic motivation tends to facilitate performance. Apparently, when people are intrinsically motivated, they are more intensely engaged in the activity itself and thereby display superior performance. Few studies have directly connected intrinsic motivation with sport performance. Intrinsic motivation is based on the innate, organismic need for competence and self-determination. Some research exists relating perceived choice or self-determination to sport performance (Alexander & Schuldt, 1982; Gould, Weiss & Weinberg, 1981; Highlen & Bennett, 1983; Horn, 1984). Cognitive Evaluation Theory (Deci & Ryan, 1980, 1985, 1988) suggested that performance can intervene between the role of reward and one's level of intrinsic motivation. This point, however, was not clearly explained by the theory. It can be inferred that reward could influence the level of performance which, in turn, may affect the level of intrinsic motivation. Performance influenced by reward can either decrease or increase intrinsic motivation. Reward tends to make people work harder, thereby making them tired. In this case increased performance could decrease intrinsic motivation. On the other hand, people often achieve better performance with reward, and they then feel more competent. Cognitive evaluation theory predicts that increased perceived competence typically lead to an increase in intrinsic motivation. It can be inferred that this situation might cause subjects' intrinsic motivation to become insulated from the adverse effect of extrinsic reward on intrinsic motivation. On the other hand, people might evaluate their level of performance on the basis of level of satisfaction: That is, a higher degree of satisfaction could increase intrinsic motivation and a lower degree of satisfaction could decrease intrinsic motivation. When intrinsic motivation decreases due to a lower degree of satisfaction, however, people tend to challenge lowered intrinsic motivation with strong self-determination and they may confront the situation, rather than feeling controlled by it.

In conclusion, intrinsic motivation may influence or be influenced by evaluation of performance. For example, in a sports situation, performance is often evaluated by oneself or by being judged by others which in turn may influence further intrinsic motivation. It seems likely that a range of cognitive processes might influence the effect of performance on intrinsic motivation. These processes are affected by one's perception of the context. Clarification of the interaction of context and cognition in this field is important.

2.5.5. Extrinsic Reward, Perceived Competence And Intrinsic Motivation

This section will deal with the relationship between extrinsic reward (tangible reward and verbal feedback), perceived competence and intrinsic motivation. It will also look at how the cognitive evaluation theory applies to the relationship between perceived competence and intrinsic motivation. Using this theory, previous research on this matter will be also examined.

2.5.5.1. Extrinsic reward, perceived competence and intrinsic motivation.

Limited research has been done on the effect of tangible reward on perceived competence and intrinsic motivation. As mentioned previously, Rosenfield, Folger and Alderman (1980) had proven that when reward was perceived as reflecting the actual ability of the subject, it increased intrinsic motivation. On the other hand, when it was perceived otherwise, intrinsic motivation decreased in spite of increase in the reward.

McCaughan and McKinlay (1981) investigated the effect on intrinsic motivation of success/failure with reward and no reward on a competitive motor task (dodging run course) among female, high school students, aged 12 to 14 years. The reward/success and the reward/failure groups received different reward instructions. The reward/success group received one chocolate bar for completing the task as often as possible, whereas participants in the reward/failure group were told that they would receive two chocolate bars if the number of circuits completed was high compared to the other students, but they were given only one. Thus, it was only the different message that was given about the conditions under which they would be rewarded that distinguished the groups; both groups were only given one chocolate bar. A pretest was executed to practice the task, and subjects were divided into four groups; i.e., reward/success, reward/failure, no reward/success and no reward/failure. The reward/success group received a chocolate if subjects completed a number of circuits more than the others, whereas the reward/failure group received two chocolates if subjects completed a number of circuits more than the others. No reward/success and failure was not given reward but was given feedback in relation to the other's performance. One day later, when reward was not given, the subjects performed the same as they did before. At the end of each session intrinsic motivation was measured in terms of satisfaction (e.g., whether it was exciting, enjoyable and interesting) , a measure used by Weinberg and Jackson (1979). The result showed that those who received only success feedback had a higher increase in performance than those who received failure feedback. Also, subject who received only success feedback increased in intrinsic motivation in the absence of reward. However, the reward with success feedback group showed a less increased performance and intrinsic motivation than that of no reward when cpmpared to the success group. This research was weak because.of a number of factors. First, the pilot test subjects were not students, but staff. Second, one chocolate as a reward may not have been appealing to the subjects, who were aged 12 to 14 years. Third, this study did not report how the subjects were given feedback by the experimenter.

In conclusion in considering use of tangible rewards, it appears intrinsic motivation was either increased or decreased, depending on whether the subject perceived the reward as reflective of ability or not. The research also suggests that perceived competence has greater effect on intrinsic motivation than reward itself.

2.5.5.2. Feedback, perceived competence and intrinsic motivation.

The effect of feedback on perceived competence and intrinsic motivation is reviewed in some detail in this section. Research has mainly concentrated on the effect of verbal feedback on perceived competence and intrinsic motivation rather than the effect of feedback from the activity itself and the level of performance achieved. Cognitive Evaluation Theory (Deci, 1975) proposed that feelings of competence and self-determination are important aspects of intrinsic motivation and that positive feedback increases intrinsic motivation, while negative feedback decreases intrinsic motivation, based mostly on changes of perceived competence and self-determination. Deci, Cascio and Krusell (1973) found that negative feedback both self-administered and administered by the experimenter was less intrinsically motivating than no feedback.

There is very little research to date that directly links perceived competence through extrinsic reward to intrinsic motivation. Vallerand (1983) examined the influence of differential amounts of positive feedback on intrinsic motivation of 50 male hockey player aged 13 to 16 years in a task which assesses hockey players, decision-making abilities (Thiffault, 1980). The task consists of 24 slides presenting a player holding a puck in different situations. Two questionnaires were used to measure intrinsic motivation and perceived competence in this study. The Task Reaction Questionnaire (TRQ), which was developed by Mayo (1977) measured intrinsic motivation, and feelings of competence were measured in three questions which indicated the subjects' feelings of competence in their performance, their reaction to the experimenter's feedback and the degree of involvement they felt in the task. Results showed subjects receiving positive feedback displayed a higher level of intrinsic motivation and felt a greater level of feeling of competence in comparison with subjects in the control group, regardless of the amount of feedback given.

Vallerand and Reid (1984) studied the relationship between feedback (positive, negative and no verbal feedback), perceived competence and intrinsic motivation. They also investigated the mediating effect of perceived competence through verbal feedback on intrinsic motivation for the stabilometer task by using path analysis, with 115 male undergraduate physical education students. The procedure was undertaken on two occasions. On the first occasion subjects were selected for participation in the main study; only those who showed at least moderate levels of intrinsic motivation for the task were selected. Three weeks after the first occasion, subjects were divided into three groups namely positive, negative and no feedback groups. During the activity, each group was given different bogus feedback by the experimenter. After the activity, subjects were asked to fill in a questionnaire on intrinsic motivation. The intrinsic motivation questionnaire used in this study was the TRQ by (Mayo, 1976). The Questionnaire for perceived competence consisted of a seven point rating scale to measure the situation for specific aspect of perceived competence on the stabilometer. Results revealed that positive feedback subjects demonstrated the highest value of perceived competence and intrinsic motivation, followed by the no feedback subjects and lowest solving was the negative feedback group. Path analysis, using multiple regression, found that positive feedback generated an increase in perceived competence which in turn led to an increase in intrinsic motivation whereas negative feedback followed the opposite pattern. This study is notable as it is one of the first studies to clearly test the perceived competence proposition of the Cognitive Evaluation Theory (Deci, 1975), using modelling techniques, which indicated that change in perceived competence mediated change in intrinsic motivation.

In a subsequent study, Vallerand and Reid (1988) examined the effect of positive and negative verbal feedback on intrinsic motivation of male and female undergraduate physical education students for the stabilometer balancing task. The second purpose of this study was to reconfirm the findings of Vallerand and Reid (1984) with reference to the mediating effect of perceived competence between verbal feedback and intrinsic motivation. Seventy subjects performed 20 trials on the stabilometer for 20 seconds each and rested for 20 seconds between trials. During performance, before every fourth trial, subjects in positive and negative feedback conditions were given positive and negative verbal feedback respectively, and they were asked to complete the TRQ (Mayo, 1976). The questionnaire for perceived competence consisted of a single question about how well they could do the stabilometer task. The results revealed that positive feedback led to a higher value of intrinsic motivation and perceived competence regardless of gender. In addition, path analysis, using multiple regression techniques, revealed that perceived competence was the mediating factor between feedback and intrinsic motivation, which is consistent with the previous study by Vallerand and Reid (1984). This result supported the study done by Blank, Reis and Jackson (1984), who found that positive feedback increased intrinsic motivation for both males and females. In contrast, Deci's (1975) study suggests that positive feedback for males increased intrinsic motivation, whereas for females it led to a decrease in intrinsic motivation. Vallerand and Reid (1988) suggested that female university students in the late 1980s may be more challenge and achievement oriented than females during the time of Deci's (1975) study.

Whitehead and Corbin (1991) examined the effect of three different types of feedback (namely positive, negative and no feedback) based on the level of performance. The subjects were seventh and eight grade school children who were required to collect data on a youth fitness test (the Illinois Agility Run). In the first phase, subjects were given two practice runs without recording the time. After the practice runs were completed, intrinsic motivation was measured. In the second phase two weeks later, time was recorded on a portable computer. The computer gave the subjects bogus feedback, which was either positive, negative or no feedback. Those in the positive feedback group were told that they were in the top 20% and the subjects in the negative feedback group were told that they were in the bottom 20%. For subjects in the no feedback group, no score was recorded and then intrinsic motivation was measured again. Perceived competence was a factor in the measurement of Intrinsic Motivation Inventory (IMI) but could not be separated scales.. Results revealed that the positive feedback group increased intrinsic motivation in all aspects and the negative feedback group decreased intrinsic motivation in all aspects. Whitehead and Corbin failed to find a gender by treatment interaction effect. Whitehead and Corbin also tested the Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985) by using path analysis which revealed that the perceived competence subscale of the IMI mediated changes in the other IMI subscales (Interest and Enjoyment, Effort and Pressure-Tension). This result, obtained using the IMI, is consistent with the work of Vallarand and Reid (1984) who employed Mayo's TRQ (1977). Subjects, initial interest in the task was not repeated.

An important difference between this research and the other studies was that instead of using an independent measure of perceived competence, Whitehead and Corbin defined perceived competence subscale of the IMI as their measure of perceived competence and still found a significant mediating role for perceived competence between extrinsic reward and intrinsic motivation.

Woodcock and Corbin (1992) examined the mediating effect of perceived competence on intrinsic motivation and the effect of verbal feedback on intrinsic motivation for cricketers, aged 15 to 18 years. They tested decision-making in cricket. The task used in this study was modified from the one used by Thiffaut (1980). It consisted of video segments on the skill of batting and fielding in cricket. On the first occasion after watching a video projected on a screen an overhead projector, subjects were selected who displayed at least a moderate level of intrinsic motivation on the IMI (version by McAuley, Duncan & Tammen, 1989). On the second occasion a week later, subjects who showed a moderate to high level of intrinsic motivation (72 out of 126) were divided into four ability groups; positive low, positive high, negative low, negative high. The positive feedback groups were told, " Your performance up to now is very good". The negative feedback groups were told, "Your performance up to now is not good". Each subject in the four groups was given verbal feedback four times while watching the video segments, and they were asked to respond as quickly as possible. Afterwards, they were asked to complete the IMI questionnaire as a post test on intrinsic motivation. Results showed that the positive feedback group displayed more intrinsic motivation than that of the negative feedback group. There was no interaction effect between the level of ability and intrinsic motivation. Using partial correlation, this study confirmed that there was a significant the mediating effect of perceived competence on intrinsic motivation , suggesting that the level of perceived competence rather than the effect of verbal feedback, was strongly and positively associated with each subscale on the IMI. In addition, the high-ability group showed significantly lower score on the press-tension subscale than those of the low-ability group. One weakness in this study was that the negative feedback given was ambiguous, that is, the phrase "is not good" could be interpreted to mean "moderate or "poor" performance. If it was the former then its effect would probably have been very weak.

Lesko (1990) studied the relationship between perceived competence and intrinsic motivation, and the difference between starters (team members) and non-starters (no regular player) among high school tennis players. Subjects were 75 secondary students of both sexes, who were asked to complete the Self-perception Questionnaire for Adolescents (Harter, 1985) in three catarogories (Scholastic competence, behaviour conduct, global self-worth) and three additional domain (job competence, humantic appeal, close friendship). The scales of Intrinsic versus Extrinsic Motivation in the Classroom (Harter, 1980) were administered. Results showed that there was no difference in perceived competence and intrinsic motivation between the starters and non-starters. When the Pearson product-moment correlation was used, it was found that the relationship between perceived competence and intrinsic motivation was not significant. This finding is noteworthy, because study did not support the suggestion of cognitive evaluation theory that there is a close relationship between perceived competence and intrinsic motivation. This study also raised some questions. The questionnaire used, that of Harter (1980) might not be suitable for sport activity because the instrument used was designed for general classroom use. Moreover, the technique of forced choice between an intrinsic and an extrinsic response for each item could be considered not to represent the relationship between intrinsic motivation and extrinsic motivation very clearly. Lastly, the distinction between starters and non-starters was not clearly by defined.

Most of the research on intrinsic motivation conducted to date has examined the effect of different forms of feedback, namely, positive, negative and no feedback, on perceived competence, rather than the relationship between perceived competence and intrinsic motivation. Cognitive Evaluation Theory proposed by Deci and Ryan (1980, 1985, 1991) states that perceived competence increases with positive feedback and decreases with negative feedback. Increase in intrinsic motivation linked to greater perceived competence occurs when the person is self-determined with regard to the activity.

In addition to reviewing the effect of positive and negative feedback on perceived competence, this section also focuses on research considering the relationship between perceived competence and intrinsic motivation, linked to feedback. More specifically, Boggiano and Ruble (1979), Deci (1971), Pittman and Swann (1977), and Vallerand (1983a) found that positive feedback about performance increased perceived competence which, in turn, increased intrinsic motivation whereas negative performance information discouraged intrinsic motivation. Koestner, Zuckerman and Koestner (1987) investigated the relationship between the nature of praise (ability, effort and no feedback), the type of involvement (ego and task involvement) and intrinsic motivation. College students participated in a hidden-figure task and were divided into two groups: ego (testlike) and task (gamelike). Subjects were given a sample puzzle and practice puzzle for 90 seconds. After the practice puzzle game, subjects were asked to fill in their level of interest, enjoyment, competence, effort, pressure-tension and freedom-on 7 point Likert scales as a baseline for intrinsic motivation. In the second phase, subjects were told that they would play a similar hidden-figure puzzle (Nina Puzzle). After each puzzle solved subjects in the ability focused praise group were told that their performance had improved, whereas subjects in the effort focused praise group were told that they had really applied themselves well to the task. Subjects were then given free choice time when the experimenter went to obtain some questionnaires and they were given unused puzzles and two recent popular magazines. They were then observed for six minutes by an assistant who was not familiar with the experiment. Following the free choice period subjects were asked to fill in the questionnaire about intrinsic motivation again. Results indicated that subjects in the task involvement group spent more time on the puzzle than those in the ego involvement group. Subjects who received ability praise spent more time on the puzzle than the effort praise group or no praise group in the task involvement. Subjects who received effort praise displayed more intrinsic motivation under task involvement than under ego involvement group, whereas those who received ability praise showed more intrinsic motivation under ego involvement than task involvement. A limitation of this study is that it produced different results for the free choice measure and the self report measure of intrinsic motivation. Also, the task used in this study was not consistent over all occasions. The study did not examine the reliability of the questionnaire.

A study by Harackiewicz (1979) investigated the effect of both rewards and feedback on high school students' intrinsic motivation using the NINA puzzle. Six different experimental conditions were no reward with no feedback, no reward with positive feedback, task contingent reward with no feedback, task contingent reward with positive feedback, performance-contingent reward (norms supplied) with positive feedback, and performance-contingent reward (no norms supplied) with positive feedback. The study consisted of three sessions. The first and third session were group administered in the class and in the second session subjects were individually tested. One month after the first session the second experimental session commenced and continued for 2 weeks, and the third session commenced a month after the second session. The dependent variables used for measuring intrinsic motivation were an experimental enjoyment scale, time spent on task, volunteering to return score, extra puzzles completed, post test enjoyment and individual recall. Results indicated that in the conditions where subjects received positive feedback, they showed increased intrinsic motivation but performance-contingent and task-contingent rewards decreased intrinsic motivation relative to control conditions of no reward. Positive feedback increased interest compared to no feedback. This study emphasised that positive feedback has a greater influence compared to the overjustification effect. Performance contingent reward and task-contingent reward reduced interest compared to control conditions. This study suggests when comparing performance-contingent rewards with task contingent-rewards or control feedback from the task should be taken into account. A limitation of this study was five different ways were used to measure intrinsic motivation, namely enjoyment, time, volunteering, initial and post enjoyment. Harackewicz failed to test the reliability of these measures. It appears that the definition of intrinsic motivation in terms of volunteering and extra puzzles solved is questionable. The average inter-correlation of the five measures was .51 suggesting that they were not very highly correlated. Another limitation of this study is that performance contingent reward was more likely to reflect a controlling aspect because students were promised a reward for performing better than the average high school students. The performance of average high school students was not clear, however, less controlling.

Weinberg & Ragan (1979) investigated the effect of positive and negative feedback on the intrinsic motivation of undergraduate students using a pursuit motor task. Results indicated that subjects given positive feedback displayed more intrinsic motivation compared to those given negative feedback. The various measures used to reflect intrinsic motivation were leisure time, an intrinsic motivation questionnaire (Calder & Staw, 1975; Kruglasli et al 1971; Weinberg, 1978) enjoyment, free choice time, and volunteering for future return (Calder & Staw, 1975). Males displayed more intrinsic motivation in competitive than non-competitive conditions, whereas no differences where recorded for females. These results are contrary to Deci's (1981) findings, where subjects in competitive situations displayed lower intrinsic motivation than in non-competitive situations. The difference between these two studies may be related to the different ways intrinsic motivation was measured in Deci's (1981) study The dependent variable in that study was a behavioural measure of free choice time, whereas Weinberg and Jackson (1979) used a motivational questionnaire.

In summary, most of the previous research has suggested that positive feedback tends to increase intrinsic motivation because it makes the individual feel competent and more determined to perform better. In contrast, negative feedback tends to decrease intrinsic motivation because the individual perceives it reflect lack of competence. These findings agree with the presupposition of the cognitive evaluation theory on the same matter, that is, that intrinsic motivation and perceived competence are intimately inter-related. Hence, intrinsic motivation is strongly affected by one's perceived competence and verbal feedback, whether positive or negative frequently influences perceived competence.

2.5.6. Verbal Feedback And Performance

Butler and Nisan (1986) examined the effect of feedback on intrinsic motivation and performance on three groups of 12 year old students. The study was conducted over two days with 3 separate sessions. In Task A, students were required to construct as many words as possible from a longer one. Task B consisted of two parts, based on work by Torrance and Templeton (1963). In the first part of this task, students were asked to construct a word tree using the first and last letter of each preceding word, while the second part of the task consisted of a circles test. A questionnaire measuring their overt motivational attitudes was also administered to the students. The experiment consisted of three sessions. Session one was conducted in one day and the feedback was identical for each group. Session two and three were conducted two days later with an interval of two hours between them. In session two, group one were informed of their performance, group two were given a grade and group three were informed that the booklet was being returned to them. In session three, subjects received no feedback. Results indicated that on the "word task" students who were given verbal comments outperformed students who were given grades. However, the two feedback groups performed better than the no feedback group. Most importantly, when no feedback has given for session 3 for all groups, performance improved more for the verbal feedback group than the group that received grades and the no feedback group. The study also found that subjects who received verbal feedback experienced significantly more interest than did those students who received grades or no feedback. This research concluded that there is a dynamic interaction between individuals and the tasks they are involved in. Whether intrinsic motivation is maintained or reduced varies according to the nature of the feedback. However, there are some limitations to this study. The duration of the testing period of two days from pretest feedback test two hours from this to no feedback retest was too short to generalise about the continuing level of performance and intrinsic motivation. Furthermore, the questionnaire for motivational attitudes was not tested for reliability. The tasks in this research are difficult to relate to the sports domain. The research does indicate that verbal feedback is effective as a reward to improve performance and increase intrinsic motivation. It also suggests that removing reward does not always result in decreased performance and intrinsic motivation

Martens (1970) analysed the effect of different types of feedback on the accuracy of performance of a motor task which required subjects to roll tennis ball up an inclined board to a target area. The ball's position up the inclined board was the subjects' score. The subjects were divided into five feedback groups. These were positive feedback, negative feedback no comment a conversation control group, which meant the experimenter conversed with the subject about school activity in order to avoid any reference to his performance, and the combined group which received praise when there was improvement and was reproved when performance decreased. Subjects were given 40 trials with a two minute rest after trials 12, 24, and 32. Results indicated that there was no social reinforcement of performance. The main effect of gender on performance was significant indicating that boys were more accurate than girls in quality of performance. The differences between boys and girls for positive, negative and the two control groups (no comment and conversation) were not significant. Girls were less accurate than boys, however, in the combined group (positive and negative). The girls were most accurate when performing under the conversation control treatment and performance was significantly more accurate here for girls, than under negative and combined conditions. The results also indicated that the boys in the combined treatment were significantly more consistent than girls. It appear that social reinforcement was not a significant influence on qualitative performance of task. The limitation of this study is the small number of subjects in each group. Besides, the subjects' interest in the task was not considered. Moreover, the task appeared to be difficult considering the age group, 3-5 years. This study also focused only on a short period without analysing results in the long term.

Roberts and Martens (1970) investigated the effect of positive and negative feedback, reinforcement (with knowledge of results but no evaluative comment) and a control group (who performed in the presence of the experimenter, but received no comments) on a coincident timing device developed by Schmidt and Hubbard (1967). The task required the subjects to accelerate a cursor such that the cursor arrived at a point where the object and the target struck each other simultaneously. Male undergraduate students were randomly selected to participate. Each subject received 30 trials with knowledge of results. After every fifth trial, subjects were informed of their total score for the preceding five trials. During the 30 trials, subjects performing in the non reinforcement group received 30 trial with knowledge of results. Subjects were given feedback corresponding to the subjects' treatment and six trials were selected at random. Results revealed that the main effect of treatment on performance was not significant at the 0.05 level. All subjects improved their performance significantly over the trials, however. Failure to find significant difference between the four reinforcement treatments may be due to the failure to assess, in a systematic way, whether the subjects in the positive and negative reinforcement were aware of the reinforcement contingencies. This study has various limitations. It focused only on a short period of time. Moreover, the feedback was administered by different experimenters and therefore it might not have had the same impact on all the subjects.

If a single experimenter were used, then the difference may have been significant. The task may not be very appealing to university students as it required no logical thinking.

Gill and Martens (1975) conducted a study on the effect of social reinforcement on the performance of rolling a small ball to a target area in the middle of an inclined board. The subjects in this study were girls aged from 13 to 14 years. Gill and Martens did two studies. Study 1 tested the effect of knowledge of results and social reinforcement on the novel motor task in the initial learning period. Study 2 examined the same effect in a later period, when the task was learned well. Results revealed that performance for subjects receiving the knowledge of results was superior to that of subjects with no knowledge of results. Similarly, subjects who were given positive feedback performed better than those who did not receive positive feedback. However, in study 2, positive feedback had no effect on performance when the task was highly learned. It appears that subjects lost interest in this task after several trials. Thus, subjects did not put in much effort during the later period of the testing.

Vallerand (1987) examined the effect of positive feedback on the performance of a qualitative task (Thiffault, 1980), to test hockey players' decision-making abilities. Male hockey players aged from 13 to 16 years were shown 24 hockey slides of hockey players in different situations. For each slides, they were required to make the correct decision, as quickly as possible. Subjects in the control group were not told anything about task performance. Subjects in the four positive verbal feedback groups were provided with different ratios (25%, 50%, 75%, and 100% out of 24 slides) of bogus feedback. After performing the task, subjects filled out two questionnaires, considering involvement in the task and perception of the veracity of the experimenter's feedback, which was scored on a seven point scale. Results showed that performance for each ratio of verbal positive verbal feedback reinforcement was significant, compared to the control group ($p<0.04$). In order to test for the presence of an inverted-U relationship between the ratio of positive feedback on performance, a polynominal trend analysis was executed. Positive feedback in a ratio of 50% showed the best performance, followed by 25%, and 75%, 100% and no verbal feedback. This study suggests that the level of verbal positive feedback affected performance differently, based on the level of verbal feedback which was employed.

In conclusion, the relationship between verbal feedback and performance appears to be generally positive, but it is not necessary to provide feedback on every trial. The ability of the performer may influence intrinsic motivation. Neutral feedback suggests that subjects are only given information on their exact achievement with no evaluative or motivation comment. Also, there are very few studies regarding neutral feedback given to athletes by their coaches or deduced by athletes from their own observation of the outcome. It appears that neutral feedback plays an important role in performance and motivation in the area of sports as subjects feel competent or incompetent by observing the outcome of their performance. However there is little mention of neutral feedback and its effect on performance. It has been neglected compared to the examniation of positive and negative feedback effects on performance. Previous studies suggest that when the task is complex to the subject, positive feedback does not promote the performance, because the task itself gives more information than the verbal feedback. On the other hand, when the task is familiar to the subject, verbal feedback is more likely to affect the performance. In most sport competition settings, there are multiple sources of feedback, both and informational, direct and indirect. It is important to further investigate the relative influence of these different sources of feedback on performance, perceived competence and intrinsic motivation, as well as the influence of the valence of feedback.

2.5.7. Research on Age, Gender and Intrinsic Motivation

This section of the literature review focuses on how age and gender influences the effect of extrinsic reward on intrinsic motivation. Most of the previous research has investigated the effect of extrinsic reward on intrinsic motivation with reference to a particular age group, without comparing various age groups. Results depend partly on the level of cognitive ability, skill, level of performance and task preference. Also the effect of extrinsic reward on intrinsic motivation involves the consideration of gender role socialisation and the selection of appropriate tasks for on gender.

2.5.7.1 Age.

Results indicate that extrinsic reward decreases intrinsic motivation for the target task regardless of the age group (Deci & Ryan, 1985; Harackiewicz, 1979). It appears, however, that differences in cognitive processing ability determine how different age children of different ages perceive extrinsic reward. Thus, it is possible that the effect of extrinsic reward on intrinsic motivation is associated with the perception of the reward, which is dependent upon the age of subjects. For example, preschool children aged 3 - 4 used as subjects in Lepper and Greene's (1975) study, may not have acquired sufficient knowledge to evaluate cognitively the controlling aspect of extrinsic rewards and its influence on intrinsic motivation for drawing pictures, but results showed that giving extrinsic reward to 3 - 4 year old children decreased intrinsic motivation. In contrast, Halliwell (1978), Ross (1976), and Smith (1975) found that preschool children perceived reward as a bonus which supported the additive principle, whereas second grade and older children regarded the reward as a bribe resulting in a decrease in intrinsic motivation.

A study by Loveland and Olley (1979) used 3 - 4 year old children as subjects to clarify the effect of reward on intrinsic motivation after a delay of seven weeks. Rewarded children with high interest in the drawing task showed decreased interest a week later, whereas low-interest children who received reward (good player award) displayed increased interest. However, seven weeks later interest returned to its initial level for both groups. At the time the reward was given, rewarded children regardless of high or low interest displayed more drawings than their unrewarded counterparts.

Boggiano and Rubble (1979) found that performance-contingent reward for young children aged 4 - 6 years old was associated with greater intrinsic motivation in the hidden picture game than task-contingent reward. Competence information relatively influenced intrinsic motivation in older age groups (9 -11 year old) whereas younger age groups (4 - 6 years old) were not influenced by competence information in the Boggiano and Rubble study.

Pinder (1976) found that male secondary school students participating in a mechanical building task showed a decrease in intrinsic motivation when they received an extrinsic reward. Harackiewicz (1979) explored the reaction of secondary school students who were rewarded for hidden puzzle solving and found a decrease in intrinsic motivation. A study by McCaughan and McKinlay (1981) found that giving positive feedback to female students aged 12 -13 increased performance, which in turn enhanced intrinsic motivation in comparison with students who received the negative feedback students on the Dodging Run.

Koestner, Zuckerman, and Koestner (1987) found that boys aged 10 - 12, were more motivated when acknowledged for their ability, whereas females were more intrinsically motivated in response to praise for their effort. Orlick and Mosher (1978) revealed that children in the age group 9 to 11 who received an unexpected award (trophy) spent the least amount of time on stabilometer task , in a free choice period, followed by the expected reward subjects. The no reward group showed the highest free choice time. Schunk (1983) found that children aged 9 to 11 years old who received performance-contingent rewards, increased performance and intrinsic motivation on a division skill in comparison with children who received rewards for participating in the task regardless of performance.

Deci (1971, 1972a) studied the effect of monetary reward on intrinsic motivation of college students for puzzles and writing articles respectively. Results indicated that task-contingent reward decreased intrinsic motivation. Deci (1972b) and Deci, Cascio and Krusell (1975) tested the effect of feedback on intrinsic motivation of college students doing puzzles. Results indicated that male subjects showed increased intrinsic motivation with positive feedback whereas females showed decreased intrinsic motivation with positive feedback. Vallerand and Reid (1984) studied the effect of different types of feedback on the intrinsic motivation of college students. They found that negative feedback decreased intrinsic motivation whereas positive feedback increased intrinsic motivation.

Studies of the effect of tangible reward on intrinsic motivation trialed with different age groups have produced mixed results. For example, younger children respond differently because of their different perception regarding reward. Other ages also do not show clearly whether reward has positive effect or negative effect on intrinsic motivation. However, positive feedback, regardless of age, appears to lead to an increase in intrinsic motivation. Therefore, it is necessary to consider the effect of age on factors like reward and its effect on intrinsic motivation. It appears that the difference in age and the effect of extrinsic reward on intrinsic motivation depends mainly on cognitive ability, and is based mostly on the level of interest and socialisation as well as different reward contingency.

2.5.7.2. Gender differences.

Carone (1975), Deci, Casio, and Krusell (1975) and, Young and Lung (1982) demonstrated that males who received positive feedback showed greater intrinsic motivation in comparison with males who received no praise whereas females who received positive feedback displayed less intrinsic motivation than females who received no praise. The influence of gender on the effect of extrinsic rewards on intrinsic motivation is mainly due to sex role socialisation practices (Deci et al, 1975) Males often consider prase as informational whereas females consider praise to be controlling. .Koestner, Zuckerman and Koestner (1987, 1989) found that females in the no praise condition increased intrinsic motivation relative to the praise condition whereas males in the praise condition increased intrinsic motivation in comparison with the no praise condition. Also, Zuckerman et al found that males showed an increase in intrinsic motivation when ability praise was given, whereas females displayed an increase in intrinsic motivation when effort praise was given. As mentioned in an earlier section, a recent study by Vallerand (1988) showed that males and females responded similarly to positive feedback which increased intrinsic motivation. The difference may be due to a change in the sex role of females. Nowdays females are more likely to be achievement oriented and are more competent than of females in the past.

The study by Blank, Reis, and Jackson (1984) investigated the effect of verbal praise on intrinsic motivation for both males and females with undergraduate students who displayed gender congruence which measured subjects' perception of sex linkage to the task. Results found that subject's gender did not interact with task sex linkage. Thus, gender linkage manipulation was effective. Two experiments were performed. Experiment 1 was a sex neutral task, the spill and spell word cube game consisting of 30 letter cubes, which was found to be interesting and readily manipulable as to sex linkage. The word cube game required subjects to make interlocked words from letter cubes tossed randomly. Males were asked to create 12 words that referred to masculine task objects, and females were asked to create 12 words that referred to feminine objects. Subjects were told that their performance was to be evaluated on three factors namely the number of letters they used in each of the words, the time taken to spell the twelve words and the number of tosses of the letter cubes. Subjects were required to complete one of the four possible questionnaires which was determined by their performance. The experimenter left the room in order to give the subjects' free choice time and the subjects behaviour was observed by another experimenter who recorded the subjects behaviour for eight minutes. After completion of three words, subjects received positive verbal feedback by the experimenter. During the free choice time, subjects were given the option of doing anything they pleased, such as to read a magazine or to play with the puzzle. They were then asked to fill out a questionnaire with 14 items consisting of nine for subjects' perception of task, four for subjects' attribution of their performance and one asking whether they were more likely to do better on the task. Results revealed that the positive feedback group for both males and females played with the task longer (272.2 seconds) in the free choice period than the control group (169.1 seconds). Results also revealed that there was a significant main effect of praise. There was significant interaction of subject gender with the sex linkage of the task, indicating that females played longer when the task was female-oriented, whereas males played longer when the task was male-oriented. In addition, secondary measures revealed that praise increased subjects' enjoyment of the task. Overall, females enjoyed the task more than males. Females felt a greater desire to play a similar task in the future, and females perceived that they could do well in this task in the future more than males did. Females valued the skill and abilities word puzzles involved more than males did. This difference indicates that the word game may not have had the same meaning for male and female subjects. Therefore, the difference in results for male and female subjects regarding the effect of positive feedback on intrinsic motivation may be related to gender-task congruence rather than to socialisation differences (Deci 1972; Deci, Cascio, and Krusell, 1973). Blank et al (1984) concluded that since in eight years Deci's (1975) study remarkable changes appear to have occurred in the socialisation processes influencing adolescents and young adults. Positive feedback may have imparted information about one's ability to perform it is possible that females in 1984 have been encouraged more toward achievement, competence and self determination than those who participated in the past study (Deci et al, 1975). Besides, the sex appropriateness of the task appears to be an important factor in determining the effect of positive feedback on intrinsic motivation. If the task is appropriate for both genders, then the effect of positive feedback on intrinsic motivation is likely to be the same.

The second study, reported in the paper by Blank et al. (1984), investigated the effect of positive feedback on intrinsic motivation for puzzle solving on the same task which was used by Deci, Cascio and Krusell (1975). Subjects were on female undergraduate students who showed a traditional female attitude on the Bem Sex Role Inventory in the second experiment. Subjects were considered if their masculinity score was less than 97, their femininity score was greater than 97, and there was a difference of at least 10 points between the two. The procedures in the second experiment were the same as experiment 1. The task used in this study was the SOMA puzzle consisting of seven pieces of plastic as used by Deci (1972). Results revealed that the positive feedback group spent more free choice time on the task rather than the control group, which is consistent with the result of experiment 1 and is the opposed to the results of Deci (1972, 1975). Therefore experiment 2 showed that females who were rated as following traditional socialisation practices also showed increased intrinsic motivation with positive feedback. This bring into question the conclusion of Deci et al. The other possible factor which might have affected females differently could be the manner of presenting the positive feedback.

Luyten and Lens (1981) found that male undergraduate students scored higher in interest, challenge, and willingness to return to the task in a model construction task than females. However, Deci (1985) argued that the difference in results may be due to the population of females in the Blank et al. (1984) study. This subjects came from a very highly achievement oriented background. This does not seem to explain the results of the second study of Blank et al. (1984). Lepper and Greene (1973) found that the effect of extrinsic reward on intrinsic motivation in drawing pictures was not influenced by gender. They argued that this result arose because there is very little differentiation of sex role in 3 - 4 years old children. In addition, there was no significant effect of tangible reward on intrinsic motivation of the males and females.

In conclusion, little research has been done on the way in which gender relates to the effect of tangible reward on intrinsic motivation. However, some research has suggested that verbal feedback tended to have a different effect on intrinsic motivation based on gender. The effect of positive feedback might not depend on the gender role difference, but be based on the context of the task, that is whether the task is appropriate to the gender of the subjects. For example, both male and female physical education students increased intrinsic motivation with positive feedback in the recent study by Vallerand and Reid (1988). Although gender difference research has dealt with college students, there is little research with adolescent subjects. There is a need to examine further how either tangible or verbal feedback influence genders.

2.6. Conclusions From Review Of Literature

The analysis obtained from the review of literature deals with the effect of extrinsic reward on performance, perceived competence, and intrinsic motivation. The following aspects are focused upon: definition, theories and measurement of intrinsic motivation; the causal relationship between performance, perceived competence and intrinsic motivation with respect to extrinsic reward; and the role of gender and age. The most widely accepted definition of intrinsic motivation is the one given by Deci which is a combination of White's (1959) and de Charms (1968) definitions. Deci defined intrinsic motivation in terms of the underlying need for a sense of competence and self-determination. The definition of intrinsic motivation for research purposes is the attraction of the task itself without any external control. Intrinsic motivation also stems from the need to challenge or master the task. Extrinsic motivation may be defined as motivation which does not come from the internal locus of causality and thus behaviour is controlled by external factors. The most common definition of perceived competence is the one given by White (1959), who used the term effectance motivation to refer to perceived competence. Perceived competence emerges from ability, capacity, skill and how well subjects deal with the environment. Thus, it can be inferred that perceived competence is an antecedent of intrinsic motivation. There are several theories relating to the effect of extrinsic reward on intrinsic motivation. According to Atkinson's (1964) Additive Principle, extrinsic reward adds to the level of achievement motivation based on intrinsic motivation, in order to produce total motivation in a given situation. Competing Response Theory (Reiss and Sushinsky, 1976) suggests that when extrinsic reward is given for involvement in an enjoyable activity it causes potential distraction. Reiss and Sunshinsky (1976) indicated that when reward symbolised success, contingent reward administered using a multiple reward procedure increased intrinsic motivation because multiple reward made the subjects feel more competent. The discounting principle and overjustification hypothesis (Greene and Lepper, 1975) states that the discounting principle refers to less attribution of behaviour to internal cause, because, in the presence of multiple plausible reasons, people tend to discount their original reason which comes from internal causality. The concept of overjustification is that subjects' intrinsic motivation may be decreased by inducing them to participate in an otherwise intrinsically interesting task in order to obtain extrinsic reward. Thus, extrinsic reward provides a clear justification for performing the activity, intrinsic motivation becomes an overjustification, and so intrinsic motivation may decrease due to extrinsic reward. The most commonly cited theory in the sports area is Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan 1980, 1985). According to Deci, intrinsic motivation is increased or decreased by the individual's perception of two aspects of extrinsic reward. One is the controlling aspect, which occurs when people perceive a change from internal to external causality of their behaviour as a result of extrinsic reward, and hence there is a reduction in self-determination which decreases intrinsic motivation. The other is the informational aspect which consists of two elements - positive and negative. When extrinsic reward gives a person positive information about competence, it enhances perceived competence, thus increasing intrinsic motivation. On the other hand when information is negative and implies lack of competence, intrinsic motivation decreases.

Intrinsic motivation is generally measured by behavioural measures (free choice time), as used by Deci (1971, 1972a, b) and questionnaire measures such as the IMI, TRQ and Harter's Questionnaire. The basis of free choice measures of intrinsic motivation is how much time subjects spend on the task in the absence of reward and the subjects' reaction to the activity. This measure is mostly used in non-sport areas. An alternative measure is the questionnaire measure which is based on the definition of intrinsic motivation; typically, this involves interest and enjoyment, perceived competence and self-determination. The Intrinsic Motivation Inventory (IMI) was developed by Ryan, Mims and Koestner (1983), based on Deci's definition, suggesting that perceived competence and self-determination are the central part of intrinsic motivation. It comprises subscales reflecting interest/enjoyment, perceived competence, effort/important, pressure/tension and perceived choice. The Task Reaction Questionnaire (TRQ), developed by Mayo (1977), consists of task interest, feeling of achievement, feeling of being challenged and reason for participation. This measure was used by Vallarand and Reid (1984) for measuring intrinsic motivation for a static balancing in the stabilometer task. Harter's Questionnaire was developed mainly to assess the development of intrinsic motivation and extrinsic motivation in the classroom. Weiss, Bredemeier and Shewchuk (1985) developed a questionnaire to measure intrinsic and extrinsic motivation for use in sport setting by modifying this scale.

The research considered in the literature review showed considerable evidence that extrinsic reward tends to decrease intrinsic motivation. This result is likely to occur when an individual regards reward as a means to an end for participating in an activity which is initially intrinsically motivating. It appears that the level of salience of the means end relationship between reward and activity plays a crucial role in decreasing intrinsic motivation. In contrast, reward did not decrease intrinsic motivation when the task was highly interesting and the subjects perceived themselves to be competent at the task. When extrinsic reward is objectively tied to performance, reward may give subjects the perception of their own competence and provide positive information about the task. Thus, it appears that, under some conditions, reward may be positively linked to intrinsic motivation. The role of successful performance tends to mediate between reward and intrinsic motivation. It is difficult to interpret the effect of extrinsic reward on intrinsic motivation without considering the perception of the level of performance, level of perceived competence and feedback from the task itself. The perception of extrinsic reward, rather than the reward itself, plays a crucial role in determining whether intrinsic motivation increases or decreases. It also appears that the results may vary, depending partly on the different operational definitions of intrinsic motivation. The dependent variable used to measure intrinsic motivation in the previous research frequently did not fully examine the validity of the measurement of intrinsic motivation.

The role of performance may be significant in considering the relationships among extrinsic motivation, perceived competence and intrinsic motivation in competitive sport settings. Performance has not been measured independently in most of the educational research. Often, time spent on the task was the only performance-related measurement considered, but it was used as the indicator of level of intrinsic motivation. Even in sports research, performance has not played a major role. It is clear, however, that extrinsic rewards frequently have a strong impact on performance (Kamel, 1989, Rushall and Pettinger, 1969). Changes in performance, according to cognitive evaluation theory, are likely to affect perceived competence which in turn is expected to influence intrinsic motivation. Bandura (1977) proposed that performance accomplishments are the most potent antecedent of self-efficacy, a conception similar to perceived competence. Refinement of cognitive evaluation theory (Deci & Ryan, 1985, 1988) have implicated performance in the extrinsic reward-perceived competence-intrinsic motivation causal relationships and recent research on extrinsic reward-intrinsic motivation in sport has began to examine the role of performance. At this time, however, the only research which has directly addressed the issue are sstudies by (Whitehead & Corbin, 1991; Woodcock & Corbin, 1992; Douglas, 1993) which were reported after the present research was designed and under way.

Research suggests that different reward contingencies may affect intrinsic motivation in different ways. Many studies have used the same contingency in different ways and researchers have employed different terms, consequently results appear inconsistent. Task-contingent reward is given to subjects for performing the activity only, not for attaining a standard of performance , thus it is understood that subjects perform due to the existence of reward. Task-contingent reward appears to decrease intrinsic motivation compared to task non-contingent reward where subjects are rewarded regardless of whether they participate in the task. As task non-contingent reward does not clearly relate the reward to the activity, there appear to be no difference between the meaning of no reward and task non-contingent reward, with respect to the task. Task-non-contingent reward may also decrease intrinsic motivation, however, as it provides no encouragement to perform. Performance-contingent reward may either increase or decrease intrinsic motivation based on whether the informational or controlling aspect of the reward is more salient. Performance-contingent reward, which is perceived to reflect positive performance, is likely to facilitate intrinsic motivation because the reward signifies the individual's level of competence at the task. When subjects perceive that performance-contingent reward imposes specific performance requirements and, it thus controls their behaviour, intrinsic motivation is likely to decrease, because this perception of performance-contingent reward reflects a decrease in self-determination.

Teaching and coaching in sport continues for long periods of time. Presentation of an extrinsic reward would not be advisable if the long-term effect was to be a decrease in intrinsic motivation, even if an immediate increase in intrinsic motivation occurred. There is little research on the effect of exposure to an extrinsic reward on intrinsic motivation in the long term, whether the reward is presented once or on several occasions. The research that has been executed presents an equivocal picture (e.g., Feingold & Mahoney, 1975). Some research has examined the effect of removing an extrinsic reward on intrinsic motivation in the short term (e.g., Arnold, 1976). The typical finding has been that intrinsic motivation declined when an extrinsic reward, once offered and given, was removed. Few studies have examined the effect of removing extrinsic reward in the longer term, that is, giving a reward and then removing it days or weeks later, as opposed to removing the reward immediately after it was given, but testing for the effect much later. Some evidence suggests that intrinsic motivation can be maintained in the these circumstances (e.g., Loveland & Olley, 1979). Thus, the effect of removing extrinsic rewards, especially on intrinsic motivation in the longer term, is worthy of further study.

There are a number of personal factors like age and gender which may influence the effect of extrinsic reward on intrinsic motivation. There is very little research on how age influences the effect of extrinsic reward on intrinsic motivation. This is because most studies have selected one age group as subjects. Although different research has examined an age range from 3 to 4 year olds up to adult college students, comparison between studies is problematic because they have developed different research designs. Many studies have included males and females and most of these have compared these two groups. The results are equivocal, however. In some research, particularly earlier work (Deci, 1972), differences were found but in other, typically more recent work (Vallerand and Reid, 1988), it has reported that males and females behave in the same manner. It is important to examine the effect of extrinsic reward on intrinsic motivation for different age groups because different age groups might have different perceptions of reward and different cognitive processes associated with perceived competence. This would influence intrinsic motivation. Gender difference might also influence the effect of extrinsic reward on intrinsic motivation in different ways, but it is possible that changes in gender roles, in recent times, have neutralised gender differences.

The gender appropriate nature of the particular task also plays a crucial role in the effect of positive feedback on intrinsic motivation. An analysis of the influence of age and gender on the effect of extrinsic reward on intrinsic motivation is warranted in the context of the present research. The present thesis focuses on the effect of extrinsic reward, such as monetary reward and verbal feedback, on intrinsic motivation with reference to both age and gender. The main emphasis is on adolescent subjects comparing age group where differences in perception of effort and ability (Nicholls, 1982) might affect perception of reward contingencies and the information provided by the reward.

2.7 Integration of Literature Review

The foregoing review of literature was wideranging, because of the complex influences of various factors on the relationship between extrinsic rewards and intrinsic motivation. It was necessary to consider the influence of extrinsic rewards on perceived competence, as well as directly on intrinsic motivation. It was also important to examine the influence of rewards on performance. The relationship of performance to perceived competence and to intrinsic motivation was also to considered to be a critical issue. Variations in the manner in which rewards are presented and perceived was suggested to influence their effect. The relative influence of feedback derived directly from the situation and that derived from extrinsic rewards also deserved consideration. The effect of rewards on perceived competence and intrinsic motivation in the longer term, as well as the effect of removing extrinsic rewards once they have been given were also issues in need of further study. To clearly examine these issues, each was addressed individually, but they all impinge on the central issue of the influence of extrinsic rewards on intrinsic motivation. It is, thus, appropriate to conceptually integrate these factors into a view of extrinsic rewards and intrinsic motivation which forms the basis for the current thesis.

The relationship between extrinsic rewards and intrinsic motivation is of critical importance in sport, because managers, coaches and teachers frequently give positive and negative feedback. Tangible rewards are also widely used at to enhance motivation. Research in the sport context has, like the study of educational and occupational environments, adopted a cognitive evaluation theory approach. The basic conception of CET that the influence of extrinsic rewards depends on their effects on perceived competence and self-determination, has gained wide acceptance. Research has focused on elucidating the conditions under which extrinsic rewards enhance or detract from perceived competence or self-determination. Research has also focused on ways to facilitate prediction of the effects of different reward contingencies. A major focus of this research has been examination of the CET proposition that the relative salience of the controlling and informational aspects of a particular reward strongly influence its effect on intrinsic motivation.

Although a substantial amount of support for this conception has been derived from research in educational, occupational and sport settings, the research reviewed here was remains equivocal. One factor which might affect the extrinsic reward-intrinsic motivation relationship is performance. In sport and many educational and occupational situations, intrinsic feedback, that is, feedback which emanates directly from performing the task, is available to the performer. Such feedback will affect perceived competence, to a greater or lesser extent, depending on its salience. The direction of its effect, that is, whether it is positive or negative, depends on the nature of the information that it is perceived to communicate by the performer. The role of performance as a mediator in the extrinsic reward-intrinsic motivation relationship was not a focus of theoretical or research attention, although the originators of the theory have referred to it (e.g., Deci & Ryan, 1985: Vallerand, Deci & Ryan, 1988) and Vallerand and Blais (1986) did examine its influence in basketball competition. The present conception of CET proposes that performance be included as a mediating variable between extrinsic reward on the one hand and perceived competence and intrinsic motivation on the other.

It is important to understand the effects that rewards have on performance. The resulting changes in performance alter the intrinsic feedback from it. That intrinsic feedback, in turn affects perceived competence and, thus, intrinsic motivation. The effect of the reward on performance is likely to be influenced by the nature, as well as the size of the reward. Research suggests that, tangible rewards, such as money or prizes, and intangible rewards, such as positive feedback from a teacher or coach, both affect intrinsic motivation. Research to date also leaves in question the effects of different levels of reward. For example, while tangible rewards are frequently perceived to be controlling in nature, they may not be sufficiently salient as a controlling factor, when they are small, but may provide useful information, if they are related to the level of performance. In performance situations, it is also not clear from existing research what the relative effects of different kinds and levels of reward are, as compared with the intrinsic feedback emanating from performance of the task. It is important to examine these issues of the nature and size of reward and their relationship to the effect of performance feedback within the CET framework.

In coaching and teaching of sports skills, as in education and work settings, short-term effects would typically be subjugated to longer-term effects. For example, an immediate gain in performance would be of little value, if it was achieved at the expense of a long-term decrement in skill development. This can easily happen when a reward for performance in a specific training session encourages a performer to employ a technique which will achieve the goal of that session, but is an inappropriate technique for long-term development of the skill. While performance might be increased in the short-term, intrinsic motivation is likely to be reduced in the long-term, as the technique proves to be inappropriate. Thus, performance and perceived competence decline because the focus on the extrinsic reward as an end in itself reduces self-determination. Little research has examined the longer-term effects of specific or one-off rewards, nor the effects on intrinsic motivation of performing later without the rewards, so that they are removed. The conception of CET to be examined in this thesis involves the longer term effects of extrinsic rewards on performance, perceived competence and intrinsic motivation. Investigation of the effects of removing a reward given on an earlier occasion is also important in this expanded view of CET. It is proposed that such effects are likely to operate through the feedback emanating directly from performance, as well as through the longer-term influence on perceived competence and self-determination of the reward and of its removal. The expanded conception of CET is, thus, particularly appropriate to consider these effects.

A range of personal, as well as situational factors is likely to affect the complex relationships which form CET. Two which are considered to represent major influences are age and sex of performers. The literature review indicated that research findings on these factors are equivocal. There is some support for the proposal that children (up to 12 years of age) might perceive their competence and self-determination on the basis of different cognitive processes to adolescents (13 years old and over). These different perceptions of competence and self determination would be likely to affect the influence of extrinsic rewards on performance, perceived competence and intinsic motivation. Similarly, it has been proposed that males and females respond differently to rewards and to feedback, based on elements of their gender roles. Recent work questions this claim, suggesting that the use of more or less gender-appropriate tasks influences the reaction of males and females. Because these two factors are central to sports skill development during childhood and adolescence, they have been included in the current conception, as background variables.

The way in which the factors discussed here have been integrated into the examination of the effect of extrinsic rewards on intrinsic motivation in sport, based on a CET framework, is largely reflected in the models presented in Figure 5.1 and 7.5 found in chapters 5 and 7 respectively. Although not specified in those models, the influence of intrinsic feedback or performance feedback is inferred from the relative strength of the causal links between extrinsic rewards and perceived competence and intrinsic motivation on one hand and those between performance and perceived competence and intrinsic motivation on the other hand. Comparison of the influence of tangible monetary reward and intangible reward in the form of motivational feedback about performance is achieved by comparing the two studies. The research conducted in the present thesis is based on this conception of CET. This includes performance as a mediating variable. The nature of performance, thus, leads to performance feedback, which affects perceived competence and intrinsic motivation. The present research also examined how the nature of the extrinsic reward influences its effect. The relative salience of the extrinsic reward and the feedback from performance was also investigated. The conceptualisation also includes longer-term effects of reward and its removal and the role of age and sex on the cognitive processes associated with perceived competence and intrinsic motivation in performance situations. It is proposed that this elaboration on the theoretical framework, which is largely based on the results of research, permits research to be carried out to clarify critical elements of the important area of the influence of extrinsic rewards on intrinsic motivation in sport.

2.8. The Present Thesis

This thesis aimed to examine a number of aspects of the relationship between extrinsic rewards and intrinsic motivation. The focus of the research was predictions made by cognitive evaluation theory, especially concerning the relationship between extrinsic reward, perceived competence and intrinsic motivation. Because a major interest concerned the teaching and coaching of competitive and recreational sport and exercise, the role of performance in the extrinsic reward, perceived competence and intrinsic motivation relationships are a central issues for this thesis. The thesis examined predictions concerning the mediating influence of performance which have been largely neglected by research. Much of the previous research has focused on the immediate effects of introducing an extrinsic reward. An important issues for practical concern is the longer term effect of presenting a reward on performance, perceived competence and intrinsic motivation and the effect on these factors of withdrawing a reward for later performance. These issues were examined in some detail in the present thesis. While there has been examination of age influences on these relationships, it is not clear whether developmental differences in effort and ability perception during adolescence have a strong effect. Similarly, earlier research on gender differences suggested that sex role socialisation might affect the interpretation of the extrinsic reward, but more recent studies have raised some doubt about this claim. The thesis also aimed to examine these age and gender issues.

In order to examine the effect of extrinsic reward on intrinsic motivation, it is necessary to measure intrinsic motivation. The thesis first reports on studies conducted to confirm the reliability of the Intrinsic Motivation Inventory (IMI) for use with Australian adolescents. Next the thesis presents a study designed to examine the effect of a monetary reward on performance, perceived competence and intrinsic motivation, both immediately and in the longer term. The effect of removing the reward was also examined. In order to examine the causal links between these variables a path analysis, using multiple regression, is then described. This is followed by a structural equation modelling analysis, which replicated the path analysis, but also tested parts of the model and examined goodness of fit of the data to the model. The thesis then reports a second study, where positive feedback replaced monetary reward as the extrinsic reward. Following traditional analysis using Analysis of Variance techniques, structural equation modelling was, again, employed to examine causal relationships for that data. Finally, based on some concerns raised by the present results and by other research, a confirmatory factor analysis was conducted on the IMI to test its proposed factor structure.

Chapter 3. Development Of Measure Of Intrinsic Motivation

3. 1. Introduction

The valid and reliable measurement of intrinsic motivation is central to research which attempts to examine its relationship to extrinsic rewards and performance. It has already been noted that the free choice behaviour method of measuring intrinsic motivation is not appropriate for uncontrolled situations that often occur in sport. It was therefore decided to employ a questionnaire to measure intrinsic motivation for the current thesis. Several questionnaires have been developed to measure intrinsic motivation in sport and physical activity, and these were reviewed in the previous chapter. Their suitability for the present research is now considered.

In the early studies, intrinsic motivation was often measured using time spent on the activity when given free choice. That is, how much time participants spend on the activity in the absence of a reward contingency or instructions. This method was used by Deci (1971, 1972) and Lepper and Greene (1975). The same method was used by Orlick and Mosher (1978) who examined the effect of reward on the stabilometer in the motor skill setting. Intrinsic motivation has been conceived to be based on a participant's interest and enjoyment, perceived competence and self-determination (Deci, 1975). Questionnaires purporting to measure intrinsic motivation in terms of this or similar conception have been an alternative mode of measurement. However, Halliwell (1978) has suggested that researchers should use both free choice time and questionnaires at the same time, as they provide the researcher with more valuable information. Ryan (1979) used the questionnaire method to measure intrinsic motivation of college athletes in response to their scholarships. However, that questionnaire was not tested for reliability and validity. Earlier, the questionnaire method was used to measure intrinsic motivation in another context, that is, non-sport situations (Notz, 1975). Likewise, several other studies were conducted, using both the free-choice method and the questionnaire method at the same time (Calder & Staw, 1975; Deci, 1971; Harackiewicz, 1979). Furthermore, Hammer and Foster (1975), and Farr (1976) used the level of performance of the participant as an indicator of intrinsic motivation in their studies. It appears that the choice of using either free choice time or questionnaire or both is mainly dependent upon the operational definition of intrinsic motivation in the study and the nature of the study. For instance, free choice time cannot be used with uncontrolled real world situations. Thus, in a badminton tournament, for example, one must play when one's games are called and one can not play, competitively, at other times during the event, although practice is sometimes possible.

As indicated above, the free choice measurement of intrinsic motivation has been used by some researchers. However, as Deci and Ryan (1985) pointed out it can become complicated and hard to measure because of the influence of internal pressures, needs, feelings and expectations on human behaviour and performance. Moreover, further problems could occur in administering free-choice, especially in real-world situations, such as athletic competition. Also, free-choice may reflect only one's interest relative to the alternatives available in that situation, and may not necessarily measure perceived competence and self-determination. Conversely, sport situations often permit no choice. People come to play the sport which has a set start and finish time with no opportunity to select alternative activities or not to participate during period of game time.

The measurement of intrinsic motivation requires careful consideration when studying different activities. In this study, it seems that the most appropriate method for measuring intrinsic motivation is the questionnaire method because, firstly, it does not interfere with participants whilst they are involved with the task. The free choice method was used primarily in educational settings, such as building games, drawing and puzzle-solving tasks, but rarely in sports situations. Secondly, this method can lead to inaccurate conclusions because of human needs and the dynamic nature of the sport environment. The questionnaire method can be easily applied in almost any sports situation. It does not require establishment of special testing areas or artificial environments, or is the person's response made relative to the alternatives currently offered.

Several questionnaires (Harter, 1981; Mayo, 1977; Ryan, 1982) have been developed for measuring intrinsic motivation. Mayo (1977) produced the Task Reaction Questionnaire (TRQ) which consists of 23 questions scored on a seven-point scale. The questions focus on task-preference and interest, feelings of achievement and challenge, and reasons for participation. All of these items are related to the self-determination theory of intrinsic motivation. Markland (1993) suggested that the TRQ has not been examined for its proposed structure, for example using confirmatory factor analysis. This questionnaire was developed for a specific stabilometer task within the context of a laboratory setting. According to McAuley, Duncan and Tammen (1989), "the TRQ represents a useful but limiting advance in the measurement of the construct"(p. 49). The TRQ has been used in several studies involving the stabilometer (Mayo, 1977; Vallerand, 1983; Vallerand & Reid, 1984, 1988).

Harter (1981) developed a self-report measure for use in the investigation of developmental trends from extrinsic motivation to intrinsic motivation for primary school children. This questionnaire was based on White's (1959) conception of Competence Motivation. However, Harter made some improvements by focusing on a number of specific items related to motivation. Harter called it a "Self Report Scale of Intrinsic Versus Extrinsic Orientation". The measure consists of five subscales, preference for challenge vs preference for easy work, curiosity/interest vs pleasing teacher/getting grades; independent mastery vs dependence on teacher, independent judgement vs reliance on teacher's judgement and internal criteria vs external criteria, with six items for each subscale. Sentences which convey extrinsic motivation were written in one column, while those which reflect intrinsic motivation were written in another column. Participants were given scaled boxes to tick, by which they registered their responses. This questionnaire is focused mainly on how children, aged 8 to 12 years, are affected by trends of either intrinsic motivation or extrinsic motivation in the classroom based on Harter's theoretical perspective on the development of motivation applied to education. This questionnaire also has been restricted to samples of American children.

Weiss, Bredemeier and Shewchuk (1985) modified Harter's questionnaire for use in the sports domain. The researchers considerably modified the Harter model based on both confirmatory factor analysis and exploratory factor analysis to make it more suitable to sports. Participants were asked two sets of questions, one set reflecting the cognitive domain as suggested by Harter, and the other set reflecting the physical domain. To each of these questions participants were asked to tick a prepared response that closely refixed their feelings on a scale of 1 to 4. However, the level of motivation for the participants could be questionable because the choice of camp could incite additional motivation, a factor not taken into account in the case of those who are not participants. Moreover, the age factor of the participants (i.e., 8-12 years old) could have a strong influence on the nature and level of motivation, especially as the questionnaire appears to combine social relationships with sports skill development. Therefore, this factor may have affected the structure of the questionnaire.

The Intrinsic Motivation Inventory (IMI) was developed by Ryan (1982), Plant and Ryan (1985), and Ryan, Mims, and Koestner (1983) to determine the role of intrinsic motivation as an additive influence of interest-enjoyment, perceived competence, effort or exertion, pressure/tension and perceived choice. It consists of 27 items measuring the five aspects of intrinsic motivation on seven point Likert scales. This inventory is unique because it can be used in both a long and a short version. Although its original use was specific, the structure of items allows the task to be changed so it has a generic format. McAuley, Duncan and Tammen (1989) modified the Intrinsic Motivation Inventory (IMI), for use in one-on-one basketball game adopting a 16-item version for American undergraduate students. McAuley et al. then studied the psychometric properties of the Intrinsic Motivation Inventory. McAuley et al. omitted the perceived choice scale because it has yet to be validated. This study confirmed the four-factor structure to be suitable for assessing intrinsic motivation in sport. McAuley et al. found the IMI to have high internal consistency in that the four subscales showed adequate Cronbach alpha coefficients. The overall internal consistency proved to be highly reliable with an alpha coefficient of .85. Confirmatory factor analysis confirmed four first-order factors: (Interest-Enjoyment, Competence, Effort-Importance and Tension-Pressure) which converge on a second-order factor, which was identified as intrinsic motivation.

McAuley, Wraith, & Duncan (1991) investigated the intrinsic motivation questionnaire, using confirmatory factor analysis with university aerobic dance classes. Their aim was to determine the hypothesised factor structure for a hierarchical model of the IMI which consisted of five first-order factors (enjoyment, competence, effort, pressure-tension and perceived choice) which loaded on one higher -order factor (intrinsic motivation). This study also examined the relationships among perceptions of success, efficacy and intrinsic motivation. A large chi-square value, 428.61 ($p<.05$), was found. This appeared to represent a poor fit . The Adjust goodness -of fit value (0.824) showed acceptable fit of the data to the model. The Root mean square residual was quite high (.057), suggesting that the data was not a good fit. A Coefficient delta value (.87) showed that the data fitted both the first and second order models better than the null model. If the perceived choice subscales was modified, the result appeared to show that the IMI employed in the aerobic dance classes had acceptable validity. McAuley etal. concluded that the perceived choice subscale was questionable, but the factorial structure of the other four subscales and the four subscale IMI were sound.

There has been a recent trend to measure intrinsic motivation by questionnaire in the realm of sports (Vallerand, 1983; Vallerand & Reid, 1984, 1988; Whitehead & Corbin, 1991). While Vallerand has employed the TRQ (Mayo, 1977) in studies used the stabilometer. Ryan's (1982) Intrinsic Motivation Inventory (IMI) has some advantages for measuring intrinsic motivation in the present study. This questionnaire can be adapted for various tasks, without confusing the meaning of the questions. In addition, this questionnaire has been analysed using confirmatory factor analysis by McAuley et al. , who concluded that it is a suitable method to use in sports. **Also,** while there are other measures of stable trait components of achievement orientation, the present research was concerned with short term changes resulting from the introduction of extrinsic rewards. A state measure was rerquired to observe such changes and the IMI was considered to be the most effective state measure of intrinsic motivation in the literature. Thus, the present study tested a version of the IMI which was adapted from the Intrinsic Motivation Inventory, originally modified by McAuley et al. , who used it in a competitive basketball game for college students.

Before it could be used in studies of intrinsic motivation, it was necessary to convert the version of the IMI questionnaire, prepared by McAuley et al. to a more suitably modified form. This was to provide a reliable instrument for use with adolescent Australians in basketball free-throw shooting. Reliability of results were essential because of the difference in test participants who were Australian secondary school students. American university students were used in the original study, thus, there was a different cultural base, difference in age groups examined and the fact that the present studies were, unlike the original, to be carried out in a non-competitive situation.

The reliability studies which were conducted to develop a suitable modified version of the IMI, are reported in this chapter.

3.2. Internal Consistency Of 16 Item Version Of The IMI

The purpose of this study was to test the modified version of Ryan's IMI questionnaire developed by McAuley et al. (1989) to measure intrinsic motivation in sports. The questionnaire was modified to suit secondary school students and was used to assess intrinsic motivation for a basketball shooting task, where participants shot balls at a basketball hoop.

3. 2.1. Method

3.2.1.1. Participants.

Participants participating in this study were randomly selected from students aged 15 to 16 years old and 12 to 13 years old studying at Maribyrnong Secondary School in Western Melbourne. There were 93 students, 45 males and 48 females.

3.2.1.2. Task.

Basketball free throw shooting was chosen as an intrinsically interesting sports performance task. As part of the physical education curriculum, basketball allows many students to participate in a challenging activity. It also provides a measurement of competence for the students in relation to their progress in the physical education participant. Also, from the research point of view, it is easy to evaluate performance in the basketball shooting task. Testing can be done in a controlled environment, that is, one location, and a substantial number of participants can be tested in order to provide meaningful data for reliability analyses.

Twenty test shots were taken at the basketball hoop from four metres away directly in front. Four practice shots preceded these to allow participants to get used to the testing condition. On completion of the twenty test shots the participants were told their score based on the scoring system displayed Table 3.1. Participants then completed the IMI questionnaire. The scoring method for the free throw basketball shooting task is shown in Table 3.1.

Table 3.1.

Scoring Method for Basketball Shooting Task.

Score	Result
0	misses board completely
1	hit board does not hit ring, and does not go in basket.
2	hits board and hits ring or hits ring only, but does not go in basketball.
3	hits board, or hit ring and goes in basket.
4	goes in basket directly

3.2.1.3. Instruments.

The version of the intrinsic motivation questionnaire used for this study is presented in Table 3.2. It consisted of 16 items scored on a 7 point Likert scale from very strongly disagree (1) to very strongly agree (7). These items were modified from the McAuley, Duncan and Tammen (1989) version of the Intrinsic Motivation Inventory (IMI) which was composed of 18 items, testing interest, competence, effort and tension aspects of intrinsic motivation for a competitive sport setting. Reliability of the overall scale in the McAuley et al. study was alpha=.85 and the internal consistency of the four subscales was generally acceptable, according to McAuley et al. Alpha coefficients for each of the subscales is shown in parentheses: interest-enjoyment (alpha = .78) perceived competence (alpha = .80); effort (alpha = .84) ; and pressure-tension (alpha=.68).

Table 3. 2

The questionnaire to assess intrinsic motivation in the basketball shooting task modified from the McAuley et al. (1989) version of the Intrinsic Motivation Inventory.

---

1 I enjoyed doing the basketball shooting just for the fun of it.
2 I think I am pretty good at the basketball shooting.
3 I made a lot of effort in the basketball shooting.
4 I felt tense while doing the basketball shooting.
5 I would describe the basketball shooting as very interesting.
6 After doing the basketball shooting for a while I felt pretty competent.
7 It was meaningful to me to do well at the basketball shooting.
8 I felt pressure while doing the basketball shooting.
9 Doing the basketball shooting was fun.
10 I tried very hard while doing the basketball shooting.
11 I was very relaxed while doing the basketball shooting.
12 This basketball shooting activity did not hold my attention.
13 I am pretty skilled at doing the basketball shooting.
14 I did not try very hard at doing the basketball shooting.
15 I was anxious while doing the basketball shooting.
16 I could not do the basketball shooting very well.

Two of the 18 questions were deleted. The following questions ; Q1, While playing basketball, I was thinking about how much enjoyed it (INT-ENJ).and Q2, I am satisfied with my performance at this game (COMP) were deleted because of similarity to other questions on the Interest/Enjoyment and Competence subscales respectively. This was in accordance with the results of confirmatory factor analysis by McAuley et al. They found that the factor structure was not affected by the removal of these two items, while internal consistency of the respective subscale was improved. For the remaining items the part of each question, which describes the task was changed from basketball to basketball shooting.

3.2.1.4. Procedure.

The students entered the gymnasium individually. Each student was directed to a line four metres from the back line of the basketball court. The participants were told that they had four practice shots before beginning 20 test shots. After every shot the student was told the score of that shot and on completion of the 20 basketball throws, the final score. The student was then instructed how to fill out the 16 item modified IMI. Then he or she filled it out, was thanked for their help and left the gymnasium.

3.2.3. Results

The results of students' responses to the questionnaire were collated to produce means and standard deviations and these are shown in Table 3.3. Questions 4, 8, 12, 14, 15, and 16 were negatively keyed, so scores on them were reversed prior to analyses.

On the seven point scale the mean should not be extreme, suggesting that participants are generally either very positive or very negative about the item. However, if basketball shooting is an intrinsically interesting task, as suggested here, means should reflect this, being to the positive side of neutral. Mean values between 4.0 and 5.5 would reflect this general response pattern. More positive means than this might suggest that the item was not discriminating well, perhaps because secondary school students responses were influenced by social desirability or experimenter pleasing response sets. Most means are in the expected range.

Table 3.3.

Means and Standard Deviations for the 16 Items of the Modified Intrinsic Motivation Inventory (N = 93)

Dimension (factor)	Item	Mean	Standard Deviation

Interest/ Enjoyment	Q1	5.38	1.71
	Q5	4.79	1.59
	Q9	5.89	1.52
	Q12	3.96	2.05
Perceived Competence	Q 2	4.24	1.76
	Q 6	5.13	1.59
	Q13	4.31	1.82
	Q16	4.22	1.96
Effort/ Importance	Q 3	4.94	1.65
	Q 7	4.73	1.69
	Q10	5.25	1.66
	Q14	4.13	1.95
Tension/ Pressure	Q 4	3.80	1.91
	Q 8	4.08	2.05
	Q11	4.48	1.81
	Q15	4.06	1.81

The standard deviation provides an indication of the breadth of participants' responses across the scale used. A small standard deviation suggests that participants are grouped tightly around the mean so the item does not differentiate well. A large standard deviation can indicate that many participants are selecting extreme scale values, approaching a bimodal distribution, dividing the participants into two distinct groups. This is equally inappropriate. Moderate standard deviations are most desirable for the current purpose of these scales, for example values around 1.0 to 1.5. In general the standard deviations in Table 1 are larger than desired.

Items 1, 5, 9, and 12 aimed to measure the level of intrinsic motivation as Interest-Enjoyment in Basketball free throw shooting. Among the four items, the standard deviations of items 1, 5, and 9 were between 1.52, and 1.71, which was a moderate level. However, the standard deviation of item 12 was rather higher than the other items. On this subscale, the participants were neither too close to, nor highly polarised about the mean, as the standard deviations, were at a moderate level. Also this subscale had means ranging between 3.96 and 5.89 reflecting a positive response to an intrinsically interesting task.

The means of the Competence subscale showed promise. They were on the positive side of neutral and indicated that the participants felt relatively competent on the whole. However, standard deviations were slightly higher than desirable, suggesting that participants were spread widely across the range of this subscale, possibly choosing extreme responses.

The Effort-Importance subscale had means between 4.13 and 5.25. This, again was a positive set of responses. The standard deviations were higher than appropriate for this subscale as well. Item 14 particularly needed to be examined as it's standard deviation figure was high compared with the other three questions which were acceptable.

The Tension-Pressure subscale had relatively low means compared to the other subscales, nevertheless these means were acceptable bearing in mind that this was a negatively directed subscale. The standard deviations were too high, suggesting quite a polarised and inconsistent response.

An approach to evaluating internal consistency reliability is based on Cronbach's (1951) alpha coefficient. Cronbach's alpha is a summary measure of internal consistency based on a calculation of the amount of intercorrelation or similarity of all items examined simultaneously. The alpha coefficient provides a statistical estimate of the degree to which all the individual items in the scale are consistently measuring the same underlying concept. The calculated Cronbach's alpha coefficient theoretically ranges from 0 to 1. Values close to 1 denote greater internal consistency reliability in the scale. Item-total subscale correlations are used to refine an instrument during its developmental stages. Clearly, the items that correlate most highly with the total scale score are also those items that correlate most highly with each other and reflect items measuring the same underlying factor.

Table 3.4 reflects the results of correlational and alpha coefficient analyses on the data collected using the first questionnaire. It suggests which questions are not good examples of subscale, whether each should be discarded or reworded must be judged from its nature.

The item subscale correlations suggest moderate correlation in the Interest-Enjoyment subscale of items Q1, Q5 and Q9 with each other; Q12 on the other hand had little correlation with this set of questions. Alpha coefficients of Q1, Q5, Q9 and Q12 showed that a larger subscale alpha (0.77) was generated when Q12 was excluded. These results indicated that modification of item 12 might produce a more consistent subscale. A somewhat higher subscale alpha would also be desirable.

Table 3.4

Item-Subscale Correlations of Each Item in the IMI and coefficient Alpha of Sub-Scale with Item Excluded (N=93).

Dimension	Item	Item-Subscale Correlation Coefficient	ItemDeleted Subscale Alpha Coefficient	Subscale Alpha Coefficient	IMI Alpha Coefficient
Interest/ Enjoyment	Q 1	0.60	0.43		
	Q 5	0.36	0.53		
	Q 9	0.43	0.50	0.65	
	Q12	0.27	0.77		
Perceived Competence	Q 2	0.49	0.49		
	Q 6	0.52	0.51		
	Q13	0.43	0.52	0.63	0.79
	Q16	0.24	0.66		
Effort/ Importance	Q 3	0.48	0.28		
	Q 7	0.53	0.32		
	Q10	0.33	0.42	0.50	
	Q14	0.19	0.62		
Tension/ Pressure	Q 4	0.35	0.42		
	Q 8	0.41	0.38		
	Q11	0.26	0.61	0.58	
	Q15	0.19	0.58		

In the Perceived Competence subscale Q2, Q6, Q13 were quite strongly correlated, but Q16 was not and it might have been better replaced to increase the level of internal consistency. An alpha of 0.66 for Q16 supported this view; overall the subscale alpha could be higher.

Item-subscale correlations for the Effort subscale were moderate for Q3, Q7 and Q10, but that for Q14 was low, suggesting that this might not be an effective item for measuring effort on this subscale. Alpha coefficients supported this proposition, since those including Q14 were low indicating low internal consistency, while that obtained when Q14 was excluded was quite high at 0.62 indicating good internal consistency among the other three items.

Items in the Tension-pressure subscale were correlated strongly between Q4 and Q8, however Q4, Q8 did not correlate with Q11, Q15. This might imply that the nature of Q4 and Q8 is different to the nature of Q11 and Q15. Alpha coefficients for this subscale yielded unusually distributed results.

3.2.4. Conclusion

A number of possible difficulties were suggested by the examination of this version of the IMI. First, some of the terminology may have been unfamiliar to participants in the age range being studied here particularly on the Tension and Pressure subscale. Words like "tense" (Q12), "anxious" (Q15) and "relaxed" (Q11) may not be commonly used by 13 to 16 years olds. Second, it may be that items expressed in the negative are not clearly interpreted by some participants. Questions 12 and 14 both included the word "not" with the intention of reversing their sense. This may not have been understood or noticed by some participants, while more attentive participants did appreciate the negative form. Q12 and Q14 produced weak correlations.

These alpha coefficient values were generally lower than is acceptable for internal consistency of a scale, compared to past sport psychology research. All subscales except Interest-enjoyment were below 0.60. The alpha coefficient for the subscale of Interest-Enjoyment was 0.65, and for Competence it was 0.63, whereas that for the Effort and Importance subscale was 0.50, while the Tension-Pressure had an alpha of 0.58. The alpha coefficient for this questionnaire overall was 0.78, which is acceptable itself, but cannot be accepted when there is weakness at the subscale level. In this experiment, the participants were secondary students and not in a competitive situation. It was expected that if the sentence structure was simplified and some more specialised words were modified then the alpha coefficient would be improved. In the fourth question, "I felt tense while doing the basketball shooting" the wording was changed from "tense" to "uneasy". This is might be that because the students either did not understand "tense" or their interpretations of " tense " were so variable that it was necessary to choose a simple word for the secondary students. In the fifth question "I would describe the basketball shooting as very interesting" the wording was changed to "I thought the basketball shooting was very interesting" because the words would describe" are complicated and abstract. The word "meaningful" in the seventh question was replaced by "important" and the word "relaxed" in the eleventh question was modified to "nervous" avoiding the reversal. The twelfth question "This basketball shooting activity did not hold my attention", was considered hard for participants to understand. This and question fourteen "I did not try very hard at doing the basketball shooting" and question sixteen "I could not do the basketball shooting very well" were changed to the positive form of the same question to avoid reversed items.

3. 3. Internal Consistency of First Revised Version of IMI Modified From Previous Results

3.3.1. Introduction

In the first experiment problems were observed in achieving a satisfactory level of internal consistency, especially for subscales. The correlation and alpha coefficient relationships were not acceptable. The questionnaire was modified by altering weak items. A further pilot experiment was executed. The experiment structure was as the first experiment, but a smaller sample was used to examine the new items, as it was clear that substantial refinement was necessary for adolescent Australians and it was considered to be more efficient to conduct rapid small studies until a promising version emerged and then execute a larger study to confirm its psychometric properties..

3.3.2. Method

3.2.2.1. Participants.

The participants were secondary school students from Maribyrnong in Western Melbourne. There were twenty participants. Ten of them were males and ten were females. Their ages ranged from thirteen to sixteen years.

3.3.2.2 Task.

The task for this pilot study was the same basketball shooting task as for the previous study. It was described in section 3.2.1.2.

3.3.3. Instrument

It was concluded from the previous experiment that some items on this version of the IMI were poorly worded. This was due to the questionnaire being developed for American undergraduates, whereas now it was being used for Australian secondary school students. It was suggested that the wording of some items was confusing for the participants, while particular words were not familiar to them. Changes were made as recommended in section 3. The revised questionnaire is presented in Table 3.4. Changes are highlighted in bold in Table 3.4.

3.3.2.4. Procedure.

The participants assembled outside the gym, and were tested individually, without their classmates as an audience. Each participant was directed to the free throw line four metres from the back of the basketball court. Each participant was told to stand four metres from the basketball hoop, then have their four practice shots. They then had their 20 free shots at the hoop, and between shots, they were told their score. After twenty shots, the participant was told the total number of baskets scored, then the questionnaire was completed, they were thanked for helping, left the gym and then the next participant was brought in.

Table 3. 4

Revised Version of the IMI for Basketball Shooting (Version 2).

1. I enjoyed doing the basketball shooting just for the fun of it.
2. I think I am pretty good at the basketball shooting.
3. I made a lot of effort in the basketball shooting.
4. I felt **uneasy** while doing the basketball shooting.
5. I **thought** the basketball shooting was very interesting.
6. After doing the basketball shooting for a while I felt pretty skilful.
7. It was **important** to me to do well at the basketball shooting.
8. I felt anxious while doing the basketball shooting.
9. Doing the basketball shooting was fun.
10. I tried very hard while doing the basketball shooting.
11. I was **nervous** while doing the basketball shooting.
12. **This basketball shooting activity was enjoyable.**
13. I was pretty skilled at doing the basketball shooting.
14. **I tried to do my best at the basketball shooting.**
15. I felt worried while doing the basketball shooting.
16. **I could do the basketball shooting very well.**

3.3.3. Results

The results of the study are shown in Table 3.5 for the revised version of the Intrinsic Motivation Inventory.

Examining the means of the Interest-Enjoyment subscale, it can be seen that they range between 5.45 and 6.01. A mean of 5 and above suggests quite a positive response as expected. Standard deviations range between 0.99 and 1.37, which is an ideal range for standard deviation, implying that, while the participants' response to these questions was generally positive, they were distributed well across the scoring range, not grouped at the extremes.

Table 3.5

Mean and Standard Deviations for 16 Items of the Revised Intrinsic Motivation Inventory

(N = 20)

Intrinsic Motivation Scale.

Dimension (factor)	Item	Mean	Standard Deviation
Interest/ Enjoyment	Q 1	5.45	0.99
	Q 5	5.50	1.37
	Q 9	6.10	1.07
	Q12	5.60	1.09
Competency/ Self-determination	Q 2	4.15	1.13
	Q 6	3.80	1.67
	Q13	5.25	1.11
	Q16	5.40	1.23
Effort/ Importance	Q 3	5.10	1.11
	Q 7	5.15	1.30
	Q10	5.40	1.39
	Q14	5.70	1.97
Tension/ Pressure	Q4	3.15	1.63
	Q 8	4.25	1.74
	Q11	4.95	1.09
	Q15	2.75	1.37

The means for the Competence subscale ranged between 3.8 and 5.4. This response were not as positive as the Interest-Enjoyment subscale. The standard deviations ranged between 1.11 and 1.67. It seems that Q6 showed the weakest response. It had a mean of 3.8 and a standard deviation of 1.67, the lowest mean, and the highest standard deviation. This means that this question produced a somewhat low but varied response.

The means of the Effort-Importance subscale ranged between 5.15 and 5.70 suggesting quite a positive response. The standard deviations ranged between 1.11 and 1.97. The highest standard deviation value, the response for Q14, seems to be rather high, while the other items gave quite mixed, but overall promising responses.

The means for the Tension-pressure subscale ranged between 2.75 and 4.25. On closer inspection, the low means, Q4 and Q15 were really a positive reaction. The standard deviations ranged between 1.09 and 1.74.

The correlations and alpha coefficients were calculated for these results, using the same method as for study 1 results. They are shown in Table 3.6.

As noted in study 1, when an item subscale correlation is low and when the item-deleted alpha coefficient is significantly higher than the other alpha coefficients within a given subscale, and the remaining alpha coefficients are around the same value, the outstanding item should be reworded or omitted, as it is clearly not closely related to the rest of the subscale.

The Interest-Enjoyment subscale yielded an alpha coefficient of 0.67. Q 1 with an item-deleted alpha coefficient of 0.72 looks weak, however, and should be omitted or reworded.

Table 3.6

Item-Subscale Correlations and Item deleted Alpha Coefficients for Items on the revised IMI (N=20)

Dimension(factor)	Item	Item-Subscale Correlation Coefficient	Item Deleted Subscale Alpha coefficient	Subscale Alpha coefficient	Total Alpha coefficient
Interest/	Q1	0.27	0.72		
Enjoyment	Q5	0.50	0.53	0.72	
	Q9	0.60	0.50		
	Q12	0.47	0.60		
Perceived	Q 2	0.46	0.72		
Competence	Q 6	0.55	0.67	0.73	
					0.61
	Q13	0.60	0.64		
	Q16	0.51	0.69		
Effort/					
Importance	Q 3	0.23	0.50		
	Q 7	0.74	0.13	0.51	
	Q10	0.52	0.65		
	Q14	0.30	0.45		
Tension/					
Pressure	Q 4	0.31	0.13		
	Q 8	0.17	0.50		
	Q11	0.09	0.43	0.22	
	Q15	0.59	0.65		

The Perceived Competence subscale yielded an overall alpha coefficient of 0.73, no individual alpha coefficient exceeded this, and correlations were consistently moderate to high. This subscale appears to have high internal consistency, bearing in mind the small sample.

The Effort and Importance subscale has an alpha coefficient of 0.51. the high correlation and low alpha coefficient for Q7 suggests it is a central question to the subscale as removing it reduces internal consistency substantially. Q10 has a fair correlation and a higher alpha coefficient than the others. Perhaps wording is somewhat confusing, but, thus, item appears to be reflecting the subscale in general.

The Tension and Pressure subscale has a low alpha coefficient of 0.22 with Q 8, 11, 15 alpha coefficients all exceeding this value. The highest alpha coefficient is 0.65. The items appeared to have little correlation with each other.

3.3.4. Conclusion

The alpha coefficients for the second revised version of the questionnaire showed some changes in patterns from study 1. The alpha coefficient for the whole questionnaire decreased notably to 0.60, whereas the alpha coefficient for the Interest-Enjoyment subscale increased marginally to 0.67, and for Competence it increased appreciably to 0.73. The Effort and Importance subscale alpha remained the same and was still low at 0.51. The Tension and Pressure subscale yielded a very low alpha coefficient 0.22.

A main concern from this study was the very low alpha coefficient for the Tension-Pressure Subscale. This low alpha coefficient along with Q 8, Q11 and Q5 showing higher item deleted alpha coefficients, suggests that this Tension-Pressure subscale had very little internal consistency. One reason the Tension-Pressure subscale did not work might be that it was designed for a competition situation, where this experiment was not of that nature and might not have produced Tension and Pressure consistent with low intrinsic motivation. It was decided that for this non-competitive task the Tension-Pressure subscale might be inappropriate, so it should be omitted from the next version of the test.

The wording in some questions needed to be altered so that they were easier for the participants to understand, as verified by some low alpha coefficients in this study. More explicitly, Q 1 "I enjoyed doing the basketball shooting just for the fun of it" was complex and potentially confusing as it may be that a participant enjoyed the task, but not "for the fun of it". Q10 "I tried very hard while doing the basketball shooting" may have caused difficulty because of the interpretation of the word "while." Following changes to these items, a third pilot study was undertaken.

3.4. Internal Consistency Of Second Revised Version of IMI

3.4.1. Introduction

In study two there was an improvement in correlation and alpha coefficient data for most subscales, but the overall alpha coefficient declined. However, the Tension/Pressure subscale was not contributing to the results, possibly because these studies were not conducted in a competitive environment. It was, thus, decided to repeat the study with this subscale omitted. In addition, more fine tuning of the wording of several items in the questionnaire was required to remove confusion from participants' interpretation.

3.4.2 Method

3.4.2.1. Participants.

In this study, 20 students (10 males and 10 females) from Melton Secondary School 20 km to the west of Melbourne aged between 13 and 16 years, were tested for intrinsic motivation in basketball shooting. Participants were naive to the previous research so as to remove any influence that this might have on the results.

3.4.2.2. Task.

The same task was used in this study as was used in the previous two internal consistency studies. It is described in section 3.2.1.2.

3.4.2.3 Instruments.

Tension-Pressure subscale was deleted due to low correlation and some questions were changed. The third version of the IMI consisted of 12 questions on 7 point Likert scales as shown in Table 3. 7. In this study, the tension-pressure subscale was deleted in an attempt to increase internal consistency reliability in the questionnaire in the non-competitive context. In addition, questions 5, 8 and 11 were changed. The word "pretty" was changed to "quite" for Q5 and Q8 and Q11 the sentence previously reading "I tried to do my best." was changed to read "I try hard at doing", for Q1 , "just for the fun of it" was omitted.

Table 3.7

<u>The Intrinsic Motivation Inventory Items for Basketball Free Throw Shooting</u>.

Item No.	Item Wording
1.	I enjoyed doing the basketball shooting
2.	I think I am good at the basketball shooting.
3.	I made a lot of effort in the basketball shooting
4.	I thought the basketball shooting was interesting
5.	After doing the basketball shooting for while I felt **quite** skilful.
6.	It was important for me to do well at basketball shooting.
7.	Doing the basketball shooting was fun.
8.	I tried **hard at doing** the basketball shooting.
9.	This basketball shooting activity was enjoyable.
10.	I am quite skilful at doing the basketball shooting.
11.	I tried **to do my best at** the basketball shooting.
12.	I could do the basketball shooting well.

3.3.3.4. Procedure.

As a group the 20 participants were advised of the basketball scoring system. Participants performed individually with only the researcher present. They had four practice shots and 20 test shots at the basketball ring from the free shot line four metres in front of the ring. Intrinsic motivation was then tested following the same procedure as in the previous studies. Each participant was thanked and left the gym

3.4.5. Results

The means and standard deviations for the third study are as shown in Table 3.8

Table 3.8

Means and Standard Deviation for 12 Items on Revised Intrinsic Motivation Inventory (N = 20)

Dimension(factor)	Item	Mean	Standard Deviation
Interest/ Enjoyment	Q 1	6.00	0.79
	Q 4	5.85	0.87
	Q 7	5.55	0.94
	Q 9	5.50	0.82
Perceived Competence	Q 2	5.05	1.27
	Q 5	5.05	1.37
	Q10	5.10	1.25
	Q12	5.15	1.08
Effort/ Importance	Q 3	5.02	1.19
	Q 6	5.15	0.98
	Q 8	5.25	0.91
	Q11	5.04	0.94

The means of the Interest-Enjoyment subscale ranged between 5.5 and 6.0, suggesting a positive response. The Standard Deviations range between 0.79 and 0.94 which suggested a satisfactory spread in the response to these items.

The means of the Perceived Competence subscale ranged between 5.05 and 5.15 which also suggested a positive response. The standard deviations lay between 1.08 and 1.37 which was a moderate distribution. This reflected favourably on the question construction. It was not surprising that the participants judged their interest to be higher than their competence or their effort and the importance of this task in which they were not experts and which was done only for its own sake.

The means for the Effort-Importance subscale between 5.02 and 5.25, which once again was a positive response. The standard deviations lay between 0.91 and 1.19 which pointed to the spread of response being quite wide, but not being polarised.

The correlations and alpha coefficients were then calculated for these 3 results, in the same manner as for Studies 1 and 2. The results are presented in Table 3.9.

The alpha coefficient for the Interest Enjoyment subscale was 0.83. The correlations for the Interest-Enjoyment subscale ranged between 0.44 and 0.85. The low correlation was observed for Q 1 (0.44) which reflected the possibility that it was not a true part of the subscale. This was supported by the alpha coefficient of 0.88 for Q1 while Q4, Q7, and Q9 yielded high to moderate correlations and alpha coefficients between 0.69 and 0.77. The correlation of Q 1 with the Interest-Enjoyment was low and the item-deleted alpha coefficient high, indicating question 1 needed reconsideration.

The Perceived Competence subscale had an alpha of 0.94. There was a strong correlation between all questions on the subscale, 0.73 to 0.95, and the alpha coefficients were all consistently high indicating that all items contributed to an internally consistent scale. This was a coherent scale with good internal consistency. It was assumed that the questions were understood and therefore clearly answered.

Table 3.9

Item-Subscale Correlations and Item-deleted Alpha Coefficients for the IMI (N=20)

Dimension		Item-Subscale Correlation Coefficient	Item Deleted Subscale Alpha Coefficient	Subscale Alpha Coefficient	Item Total Alpha Coefficient
	Q 1	0.44	0.88		
Interest/	Q 4	0.85	0.69	0.83	
Enjoyment	Q 7	0.69	0.77		
	Q 9	0.68	0.77		
	Q 2	0.75	0.95		
Perceived	Q 5	0.95	0.87	0.94	0.85
Competence	Q10	0.89	0.89		
	Q12	0.81	0.92		
	Q 3	0.08	0.90		
Effort/	Q 6	0.67	0.56	0.74	
Importance	Q 8	0.67	0.58		
	Q11	0.71	0.55		

For the Effort-Importance subscale, the value of the correlation for question 3 was 0.08, compared with the other correlations for this subscale, ranging between 0.70 and 0.75. The removal of item 3 from the subscale produced a high alpha coefficient (0.90). It was judged that the other three items on this subscale formed a consistent group. The alpha coefficient for this subscale was 0.74. By looking at the results, it was felt that Q3 was quite out of place. This was unexpected as it seemed to express exactly what the effort subscale was included to assess.

3.4.6. Conclusion

The results of this study, when compared to the second study, noted not only an increase in correlation of subscale questions, but also enhanced alpha coefficients for the subscales. The overall alpha coefficient for this version of the questionnaire was 0.85. The correlation of item 1 (0.44) was quite low. Question 3 "I made a lot of effort in the basketball shooting" with a correlation of 0.08 with the other items, was not considered to be acceptable either.

Due to low correlations in Question 3 in the subscale for Effort-Importance, it was deleted in order to improve the overall alpha coefficient and the correlation between the other items and, thus, the internal consistency of the Effort-Importance subscale. It was not clear why "made a lot of effort" was interpreted differently to "tried hard," (Q4) or Q8, although Q6 seems somewhat different on the face of it. It was decided to retain Q1 on the Interest/Enjoyment subscale as its structure was felt to be sound.

3.5. Internal Consistency of Third Revised Version of IMI

3.5.1. Introduction.

Further to the third internal consistency study, where the results were again improved from previous studies, it was noted that there were inconsistencies in the Effort-Importance subscale. The correlation level of question 3 was unacceptable therefore that question was removed for this study . Otherwise, it was felt that the results of that study were positive, so a large group of students was required to increase confidence in the scales.

3.5.2. Method

3.5.2.1 Participants.

For the fourth study, 80 students (40 males and 40 females) from the Melton Secondary School, aged between 13 years and 16 years were selected. As with the previous three studies, these participants had not previously been tested and so were naive.

3.5.2.2. Task

The same task was executed by the participants in the fourth study as in studies 1 to 3, that is, basketball free throw shooting. See section 3.2.1.1.

Table 3.10.

The Intrinsic Motivation Inventory Items Employed to Assess Intrinsic Motivation for Basketball Free Throw Shooting.

1.	I enjoyed doing the basketball shooting.
2.	I think I am good at the basketball shooting.
3.	I thought the basketball shooting was interesting.
4.	After doing the basketball shooting for a while I felt pretty skilful.
5.	It was important to me to do well at the basketball shooting.
6.	Doing the basketball shooting was fun.
7.	I tried hard at doing the basketball shooting.
8.	This basketball shooting activity was enjoyable.
9.	I am quite skilled at doing the basketball shooting.
10.	I tried to do my best at the basketball shooting.
11.	I could do the basketball shooting well.

3.5.1.3. Instrument.

The fourth version of the questionnaire for intrinsic motivation consisted of 11 questions, the third question "I made a lot of effort in the basketball shooting" was deleted in this study due to its very low correlation (0.08) with the other items in the Effort-Importance subscale. The 11 questions are presented in Table 3.10 in order of presentation in the questionnaire.

3.5.3. Results

The results of the questionnaire responses were as shown in Table 3.11.

Table 3.11.

Means and Standard Deviations for 11 Items on the Revised Intrinsic Motivation Inventory (N = 80)

Dimension (factor)	Item	Mean	Standard Deviation
Interest/ Enjoyment	Q 1	5.06	1.01
	Q 3	4.88	1.14
	Q 6	4.65	1.18
	Q 8	4.88	1.14
Perceived Competence	Q 2	4.63	1.22
	Q 4	4.92	1.19
	Q 9	4.88	1.19
	Q11	5.03	1.01
Effort/ Importance	Q 5	5.00	0.90
	Q 7	5.10	0.91
	Q10	5.10	0.85

3.5.1.4. Procedure

The participants entered the gym individually, where they were tested with 20 basketball shots following four practice shots. Then the questionnaire for intrinsic motivation was administered. This procedure was the same as in previous studies. Finally, they were thanked for their attendance and left gym.

The means of the Interest-Enjoyment subscale ranged between 4.65 and 5.06 and the standard deviations between 1.01 and 1.18. This reflects a positive and well distributed response by the participants.

The Perceived Competence subscale had means between 4.63 and 5.03 reflecting a positive response to this subscale. The standard deviations ranged between 1.01 and 1.22, which reflects a good distribution of responses.

The Effort-Importance subscale had means between 5.00 and 5.10, also reflecting positive response. The standard deviations were slightly lower being between 0.85 and 0.91, but still reflected a satisfactory spread of response. Internal consistency statistic, including item-subscale correlation and item-deleted alpha coefficients for each item, subscale alpha coefficients and the overall alpha coefficient are presented in Table 3.12.

The overall scale alpha coefficient is the criterion for strong internal consistency. The result here of 0.90 satisfies the requirements of effective experimentation. This suggests that the fine tuning procedures worked to good effect.

The Interest-Enjoyment subscale had a subscale alpha coefficient of 0.81. All item deleted alphas were high indicating that all items contributed to a strong subscale. The alpha coefficient for this scale is sufficiently good that it is likely that any item eleted would have a minimum impact on the questionnaire result.

Table 3.12

Item-subscale Correlation, Item Deleted Subscale Alpha Coefficients, Subscale Alpha Coefficients and the Total Scale Alpha Coefficient for the Fourth Revision of the Intrinsic Motivation Inventory (N = 80)

Item	Item-Subscale Correlation Coefficient	Item Deleted Subscale Alpha Coefficient	Subscale Alpha Coefficient	Total Alpha Coefficient
Q 1	0.51	0.81		
Q 3	0.72	0.71	0.81	
Q 6	0.62	0.76		
Q 8	0.64	0.75		
Q 2	0.75	0.86		
1.90				
.Q 4	0.86	0.82	0.89	
Q 9	0.80	0.84		
Q11	0.63	0.90		
Q 5	0.58	0.62		
Q 7	0.50	0.71	0.73	
Q10	0.59	0.61		

The Perceived Competence subscale yielded an alpha coefficient of 0.89. Q 11's alpha coefficient exceeded this, and it's correlation was lower than the others within the subscale but was still acceptable. All the correlations and alpha coefficients being high, this subscale was considered to have good internal consistency.

The Effort-Importance subscale alpha coefficient was 0.73 and all individual correlations were above 0.5, while alpha coefficients for this subscale were above

0.60 but not as high as the other scales. Although not quite as strong as the other scales, these values do suggest a sound internal consistency for this subscale.

3.5.4. Conclusions

It was anticipated that further refinement of the questionnaire, would be likely to improve the internal consistency only marginally. It should be noted that correlations were expected to be lower than for study 3 as the sample was much larger in this pilot study. The correlations and alpha coefficients as shown in Table 3.12 indicate sound questionnaire construction.

3.6. General Conclusion

The aim of this set of pilot studies was to examine the internal consistency of each subscale and the entire questionnaire for intrinsic motivation for basketball shooting, and to modify it for use in the present research. At the beginning, the questionnaire consisted of 16 questions, comprising four subscales: Interest and Enjoyment, Perceived Competence, Effort and Importance, and Tension and Pressure. The studies resulted in the questionnaire being reduced to 11 questions by eliminating the Tension and Pressure sub-category in the non-competitive setting. This subscale was poorly associated with the other subscale. However, Whitehead and Corbin (1991), Woodcock & Corbin, (1992) included this subscale. The language of IMI may not be problematic but the cultural differences between America and Australia may impact on the result of this study. In contrast Douglas (1993) found that this subscale was not associated with the other subscale as a result this study did not include this subscale. Since this internal consistency work was completed, a study by Douglas (1993) has also reported a low alpha coefficient for the pressure-tension scale, based on a five item pressure-tension subscale in a 20 item version of the IMI. Douglas used the 20 item version in the study of 10-12 years old Australian children, but on the basis of the poor internal consistency, discarded the pressure-tension items from the final IMI total score. It may reflect that Vallerand, Deci & Ryan, 1987) suggest that there are some differences of motivation between physical fitness and general sport activity. Also, the Effort-Importance, question 3, was deleted because of very low correlations with the subscale, while other questions had word changes. Through modification and repeated testing, acceptable item-subscale correlations and item-deleted alpha coefficients, as well as strong alpha coefficients for the subscales and the overall IMI, were achieved. Proper design of the questionnaire to ensure the questionnaire was understood by the present participants was important to gain accurate interpretation of the results. Reflection on the process used here, suggests that the version of the IMI tested in the fourth study was acceptable for use.

3.7. Test-Retest Reliability For The Modified Intrinsic Motivation Inventory (IMI)

3.7.1 Introduction

As a result of the internal consistency studies, the IMI was modified from a 16 item, four subscale test to an 11 item, three subscale test. In addition, the wording in several of the remaining items was changed. In the view of this degree of modification, it was felt that the modified IMI should be tested for its stability over time. This was particularly important because of the intention to examine intrinsic motivation over the longer term, so that any changes in IMI scores over a period of no activity could confidently be attributed to changes in intrinsic motivation. Thus, a test-retest reliability study was conducted.

3.7.2. Method

3.7.2.1. Participants.

On the first occasion of testing, 140 secondary students volunteered to take part. They were from a working class background, and ranged in age from 13 to 16. The sample consisted of 34 males and 36 females from Year 7, and 32 males and 38 females from Year 10. Participants were reduced to 136 for the re-test, due to unavailability of 14 students. From this group, 120 participants performed the activity and completed the questionnaire. Those who did not complete the requirements were not included in the analysis.

3.7.2.2. Task.

The task was the same as that executed in the fourth internal consistency study (see. section 7. 3.5.2), that is, basketball free throw shooting. As before, participants had four practice shots and then 20 test shots from the free throw line.

3.7.2.3. Questionnaire.

In the fourth study of internal consistency, 11 items were employed in the revised IMI and these showed high subscale and IMI internal consistency. The same 11 items making up three subscales and representing the IMI modified for use by adolescent Australians, were used in this reliability study.

3.7.2.4. Procedure.

Students participated individually in two experimental sessions approximately four weeks apart. For the first session, the experimenter explained to the student how to do basketball free throw shooting and that their score would be number of baskets scored. Then, the experimenter also explained to the participants how to fill in the IMI questionnaire. The experimenter demonstrated to the participants how the free throw shot is done. Then, the participants were given four chances to practice the shot. Then, each participant had 20 test shots from four metres away from the basketball board at the free throw line. After these 20 shots, the participants were asked to fill in the 11 item IMI questionnaire. Four weeks later the same participants repeated this procedure in the retest. After they completed the IMI on each occasion, the experimenter thanked the participants and they left the gym.

3.7.3 Results

The score obtained by the participants' on the first test were correlated to their scores on the retest using Pearson's Product Moment Correlation Coefficient by the SAS package on an IBM 486 computer, to produce a reliability coefficient. The raw data is presented in Appendix 13. The overall correlation for the revised IMI over four weeks was .956, suggesting that the test was highly reliable.

3.7.4. Discussion

Recognising the scale of the changes made to the IMI on the basis of the internal consistency studies, it was felt that the test-retest reliability of the original IMI (Ryan, 1982) and the basketball one-on-one revision (McAuley, Duncan, and Tammen, 1989) could not be assumed to extend to the present version. In order to ensure that stability was strong for the present version of the IMI, the test-retest reliability study was conducted. The results of this study with a sample of 120 adolescents, whose ages and genders matched those of intended participants in the intrinsic motivation studies planned (r=.956), represented strong support for the stability of the modified IMI over four weeks. This outcome supported the use of the revised IMI in the studies investigating the effect of extrinsic reward on performance, perceived competence and intrinsic motivation. It was concluded that this research could now be executed with confidence in the internal consistency and test-retest reliability of the modified IMI.

Chapter 4. The Effects of Monetary Rewards on Performance, Perceived Competence And Intrinsic Motivation

4.1. Introduction

Atkinson (1964) predicted that extrinsic rewards have a positive effect on the total motivation of a person with low achievement motivation. He argued that such an individual will participate more in an achievement situation if there exists sufficient reward. However, Lepper, Greene and Nisbett (1973) held a contrary view. Their statement of the overjustification hypothesis proposed that expectation of a reward negates or reduces intrinsic motivation for the behaviour, when the reward is removed. In testing these apparently contradictory theories, studies about the effect of monetary reward on intrinsic motivation have revealed mixed results. Deci (1971, 1972a, 1972b), Lepper and Greene (1973), Ryan (1977; 1980), and Orlick and Mosher (1978) suggest that extrinsic reward decreases intrinsic motivation. Other studies (Denman, Landers & Feltz 1980; Feingold & Mahoney 1975; Hammer & Foster, 1975;. Karniol & Ross 1977; Reiss & Sushinsky, 1975; Thomas & Tennant,1978) have found that extrinsic reward can either increase or decrease intrinsic motivation.

In regard to the effect of monetary reward on intrinsic motivation, Deci (1971, 1972a, 1972b) conducted studies with university students by offering some money in tasks involving puzzle-solving and headline-writing for newspapers. Those participants who received monetary reward initially showed some decrease in intrinsic motivation when the reward was withdrawn. Calder and Staw (1975b) also conducted some studies along this line in the area of completing jigsaw puzzles. Results revealed that participants who were rewarded rated this activity as significantly less interesting compared to participants who received no money. Thus, Deci (1975, Deci & Ryan 1980, 1985) proposed, on the basis of his Cognitive Evaluation Theory that intrinsic motivation can either increase or decrease depending on two factors, the controlling effect of the reward and the informational aspect. This theory suggests that when the controlling aspect is more salient the reward is perceived as controlling behaviour. The cause of the behaviour is attributed to the reward, not to interest in the task itself. Thus, intrinsic motivation decreases. On the other hand, if the reward is perceived as producing information with regard to one's feeling of positive competence in the task, intrinsic motivation increases. However, if the reward provides a feeling of negative competence in the task, intrinsic motivation decreases. This is referred to as the informational aspect of the reward. To determine whether the reward either increases or decreases intrinsic motivation depends on which factor is more salient to the individual. Arnold (1976) conducted a study on participants who were paid for taking part in Star Trek computer games. The results showed that monetary rewards did not enhance or decrease intrinsic motivation in this study where the participants had high intrinsic motivation. Rosenfield, Folger, and Adelman (1980) tested the effect of monetary rewards on intrinsic motivation for crossword games with college students. They found that when the level of rewards reflected the level of student skills, higher rewards led to greater intrinsic motivation.

Martens, Burwitz, and Newell (1972) conducted a study on male undergraduate students doing a rotary pursuit task, and Rushall and Pettinger (1969) used money to reward students aged 9 to 15 years for swimming. Results of both studies supported the finding that monetary reward increased performance. Similar results were reported by Kamal (1988) for 10 to 15 years olds for swimming. Lopez (1981) found that monetary reward increased performance and intrinsic motivation in participants' work performance, which was assessed by tidiness, absence, productivity, tone of service and ticket accuracy. Consequently, these studies appear to support the claim that monetary rewards often have a strong positive effect on performance and frequently increase motivation. However, Deci (1971, 1972a, 1972b) did not report improved performance with monetary rewards. He assumed that increased performance itself may have a positive effect on intrinsic motivation. For example, when individuals who achieve successful results receive positive feedback, they are likely to perceive their competence as higher. Thus, Deci (1975) proposed that the informational aspect of the reward will increase intrinsic motivation. That is, a feeling of perceived competence can promote intrinsic motivation, and in the same way, a feeling of perceived incompetence can reduce intrinsic motivation. It can, therefore, be argued that how the individual perceives the reward will determine whether performance will increase or decrease. If the reward is regarded as positive reinforcement then performance will improve and, if this information is perceived to enhance competence, then intrinsic motivation will improve too. In another study, Vallerand and Reid (1984) examined the role of perceived competence as a mediator between extrinsic rewards in the form of positive feedback and intrinsic motivation. Path analysis indicated that the change in intrinsic motivation was influenced by verbal feedback and was mediated by perceived competence.

Additionally, little research has investigated the long-term effect of extrinsic reward on performance, perceived competence and intrinsic motivation. Most researchers have used only a day or a few days duration for the research period. It is important to establish the long-term effect of rewards on the above factors. The effect of removing rewards on performance and intrinsic motivation is also important in real world situations like sports practice and competition. For example, Thomas and Tennant (1978) did a study on the effect of a performance contingent reward (money) on intrinsic motivation for a throwing task in children over one day. The result was that the performance contingent reward increased intrinsic motivation significantly in the free choice time compared to the task-non-contingent and no reward groups. Orlick and Mosher (1978) examined the influence of a reward (trophy) on intrinsic motivation for the stabilometer task over several days. Results were that the reward decreased the level of intrinsic motivation in the post test in comparison with the pretest. Unlike previous studies, Denman, Landers, Feltz and Landers (1980) investigated the effect of reward on intrinsic motivation for a throwing task over five weeks. Results indicated that extrinsic reward increased intrinsic motivation. However, this study did not report when the reward was last presented, suggesting the removal of reward might have been in the fifth week of the study. Loveland and Olley (1979) found that when a reward was provided, the level of interest of the high-interest children and the quality of their drawings decreased. On the other hand, the low-interest children increased in their level of interest and the quality of their drawings when they received some rewards. It became noticeable, however, that both groups returned to their initial level of interest when the experiment was extended to seven weeks.

Researchers have investigated the effect of extrinsic reward on intrinsic motivation in different age groups. Lopez (1981) conducted his study with females whose average age was 30 years and found that reward increased both performance and intrinsic motivation. Some researchers (Deci,1970, 1972 a, b; Calder & Staw 1976; Pritchard & Campbell, 1977; Staw, 1974) have used college students as participants with a puzzle game and found that extrinsic reward deceased intrinsic motivation. Other studies (Arnold, 1976; Farr, 1976; Farr, Vance, and McIntyre, 1978; Fisher, 1978; Hammer and Foster, 1975) who used different participants of the same age-levels, revealed that extrinsic reward increased intrinsic motivation. In sport, Ryan (1980) found that male football players with a scholarship decreased intrinsic motivation whereas male wrestlers and females did not decrease intrinsic motivation. Martens, Burwitz and Newell (1972) indicated that reward increases performance after the skill is learned.

With adolescents, however, Harackiewicz (1979), and Krujlanski, Friedmom and Zeevi (1971) found that reward had a detrimental effect to intrinsic motivation. In contrast, Boggiano, Harackiewicz, Bessette and Maim (1985), as well as Harackiewicz and Manderlink (1984) concluded that performance contingent reward increased intrinsic motivation in a puzzle game. In sport, Rushall and Pettinger (1969) found that a reward improved swimming performance significantly, which is consistent with the study by Kamal (1989).

In primary and preschool children, studies by Lepper, Greene and Nisbett (1975), Greene and Lepper (1974) revealed that intrinsic motivation was reduced by extrinsic reward. Unlike the studies above, Loveland and Olley (1979) found that removing the reward did not affect intrinsic motivation. In sport Orlick and Mosher (1978) found that extrinsic reward had a detrimental effect on intrinsic motivation for the stabilometer task. However, Denman et al, (1980) found that extrinsic reward facilitated intrinsic motivation in a velcro ball throwing game.

Previous studies, regardless of age, show that intrinsic motivation was determined by the controlling aspect and the informational aspect of the reward, that is, participants showed mixed reactions depending on their perception of the situation and the way the reward contingency was administ2ered. Ryan, Mims and Koestner (1983) suggested that the meaning of the reward to the recipient was more important than the actual reward itself. Most research (Calder & Staw, 1975b; Deci 1971, 1972 a, b; Harackiewicz, 1979; Green & Lepper, 1974) has revealed that task contingent and performance contingent rewards decreased intrinsic motivation. However, when the reward was seen as an indicator of the participants' progress, (Boggiano et al. 1985; Harackiewicz et al., 1984; Karniol & Ross, 1975a), it increased intrinsic motivation. Thus, the individual may have been more distracted from controlling their behaviour by the reward. Also reward given for attaining some level of achievement of the task could be perceived as information about competence by the individual. Another explanation of the mixed results appears to be that researchers operationalised intrinsic motivation in different ways. The age of participants and the level of cognitive and physical development could have been crucial in participants' response and thus, the effect of reward on performance, perceived competence and intrinsic motivation.

Unfortunately, little research has been conducted to test differences in the effect of reward on performance, perceived competence and intrinsic motivation in males and females. Some research has been undertaken with only males, whereas other studies tested either only female or both male and females without comparing gender differences. In sport, Ryan (1980) found that male athletes awarded scholarship decreased in intrinsic motivation compared to female athletes awarded scholarships who increased in intrinsic motivation. This study indicated that males and females responded differently to the same reward. Karniol and Ross (1977), and Luyten and Lens (1981) found that males showed more intrinsic motivation overall than female, but this did not interact with reward. Feltz and Petlichkoff (1982), and Granleese, Trew and Turner (1978) found that males, aged 12 to 18 years, displayed higher physical perceived competence than that of females at the same age, using Harter's (1979) Perceived Competence Scale for Children. It is likely that young children show little difference between genders because socialisation into gender roles is not sophisticated at this stage. As gender roles develop through adolescence, it is probable that gender differences in the effect of rewards on intrinsic motivation increase, especially for physical tasks, an area where differences in gender roles have traditionally been emphasised.

The aim of this experiment was to examine the effect of monetary reward on younger (12 to 13 year old) and older (15 to 16 year old) male and female secondary school students doing the intrinsically interesting activity of basketball shooting. The main focus was to investigate both the shorter and longer-term effects of monetary rewards on performance, perceived competence and intrinsic motivation as well as their interactions and relationships. Examination of age and gender differences was also an aim.

4.2. Hypotheses

The purpose of this study was to investigate how performance-contingent reward affects basketball free shooting performance, perceived competence and intrinsic motivation. A performance-contingent reward is a reward that is given for either attaining some level of achievement or symbolising in a concrete way the progress that performance has made. Sport at all ages has traditionally included reward for performance attainments which would be most useful in promoting the performer's skill and their perception of self efficacy. Telling students that they could receive a reward based on enactive accomplishments imparts a sense of competence that can be actualised through effort. Although it is possible that performance-contingent reward can be viewed as controlling behaviour, the information aspect of the reward should be more salient since it is closely tied to progress. The information value of reward rather than the reward itself appears to be a potent determinant of performance, perceived competence, and intrinsic motivation. In the present study, reward was used to focus attention on performance of the task. It was predicted that this would lead to students feeling more competent, and thus more intrinsically motivated. The promise of a reward for successful basketball shooting may promote a subject's competence, and sensitize them to performance information. The following hypotheses were proposed. The following hypotheses are presented in the alternative form, one-tail, and are tested at the conventional 0.05 significance level.

1. There will be a significantly greater increase in performance of basketball free throw shooting in Year 7 (13 years) students than in the Year 10 (16 years) students from pretest to intermediate test.

2. There will be a significantly greater increase in performance of basketball free throw shooting in male students than in female students from pretest to intermediate test

3. There will be a significantly greater increase in performance of basketball free throw shooting in the experimental group students than in the control group students from pretest to intermediate test.

4. There will be a significantly greater increase in perceived competence in the experimental group than in the control group students from pretest to intermediate test.

5. There will be a significantly greater increase in intrinsic motivation in the experimental group than in the control group from pretest to intermediate test.

Previous research suggests that when a reward is removed intrinsic motivation often declines. Removal of the reward can give negative feedback about performance and competence, leading to reductions in actual performance and perceived competence. On this basis it was predicted that there would be no difference between the experimental and the control groups at post-test on performance, perceived competence, or intrinsic motivation. Age and gender based differences were predicted to remain, as they are not based on rewards, but on self-perceptions. These experimental effects are stated as predictions rather than hypotheses as a recognition that they are not as well founded as the previous hypotheses, nor are they so central to the main concern of the thesis.

4. 3 Methods

4.3.1.Participants

The participants in this study were from two different secondary colleges for 12 to 16 year olds in the western region of Melbourne. They were all unaware of the experimental task and the measurement of intrinsic motivation. Participants were told the task involved basketball shooting, but were unaware that monetary rewards would be given to some participants. Initially, the participants numbered 260 thirteen year old (N=114) and sixteen year old (N=146) students. Of these, 171 participants displayed at least moderate levels of intrinsic motivation on the modified IMI. The main study examined these participants. However, 24 participants were deleted due to a variety of factors including ill-health, study commitments, and absences. For each of the age and sex combinations, subjects were randomly divided into experimental (reward) group and control (no reward) group conditions. The age and sex distribution of the final sample and treatment conditions are presented in Table 4.1.

Table 4.1.

Sample and Treatment by Age and Sex (N=147)

Year	Sample		Experimental Group		Control Group	
	Male	Female	Male	Female	Male	Female
Year 7	37	32	16	15	21	17
Year10	36	42	18	20	18	22

The participants were drawn from two different schools, but from similar socio-economic circumstances which were lower working class families. The basis for using participants from different schools was because it was felt that feelings of animosity, or resentment could arise, between the reward group and the non-reward group, if they were selected from the same school. The reward group comprised 69 students from one school, whereas the non-reward group numbered 78 students from another school.

4.3.2 Research Design

A 2 x 2 x 2 x 3 repeated measures factorial design was used with three between group factors, age, sex and experimental treatment, each with two levels and one within groups factor, occasion with three levels for performance, four levels for perceived competence and five levels for intrinsic motivation. All participants performed the basketball shooting task on three different occasions. The experimental conditions were rewarded and non rewarded. The first two occasions were separated by two weeks and the second and the third occasion by three weeks for each participant. The IMI was administered five times and the Perceived Competence Scale was administered on four occasions.

4.3.3 Measures

4.3.3.1 Basketball free throw shooting performance.

Participants were placed four meters from the basketball backboard and in a perpendicular position to it. Their instructions were to endeavour to shoot every ball directly through the ring without touching it. Each participant was given four practice shots and then requested to begin test performance. The researcher noted their score on each shot but participants were not told this score. On completing twenty shots, participants were informed that they had finished, and told exactly the number of balls that had gone directly through the ring. The purpose of this was to ensure that all participants had identical feedback, because some may have kept their own score. Participants were novices and may have had limited success in terms of baskets, although their accuracy might have improved substantially. Thus, to increase sensitivity in the analysis, a scoring method was implemented based an increasing scores for greater accuracy. This is presented in Table 4.2.

Table 4.2.

Scoring method for basketball shooting task.

Score	Results
0	misses board, ring and basket completely
1	hits board, misses ring, and does not go in basket
2	hits board and hits ring but does not go in basket
3	hits ring directly, but does not go in basket
4	hits board, or hits ring, and goes in basket
5	goes in basket directly.

4.3.3.2. Perceived competence.

Vallerand and Reid (1984) examined situation specific perceived competence effectively with a single item of the form, "How competent do you think you are on the stabilometer?" Responses from participants were measured on a seven point scale, with seven representing high perceived competence. When modified for the present task the Perceived Competence Scale item read, "How competent do you think you are at the basketball free throw shooting task?"

4.3.3.3. Intrinsic Motivation.

Ryan's (1982) Intrinsic Motivation Inventory (IMI) is a generic inventory, where each item refers to "the task". It is comprised of 27 items, initially forming four subscales, related to interest/enjoyment, perceived competence, effort/importance, and pressure/tension. A fifth subscale has been proposed to evaluate perceived choice. The responses from participants to each item are recorded according to a seven point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (7).

McAuley, Duncan, and Tammen (1989) modified the IMI for use with a basketball jump shooting game. Their claims included that previous research had demonstrated the original inventory to be strong in structure, minimising losses when items were omitted and leaving the existing subscales intact when one was excluded. Therefore, an 18 item version was implemented by McAuley et al. (1989) to reduce redundancy in a test of its factorial structure and internal consistency. Although sound in factorial terms, their internal consistency analyses suggested that the omission of two items would increase internal consistency and retain the factorial structure. The present study used a 11 item version of the IMI modified for the basketball shooting task from the 16 items basketball one-on-one game version employed by McAuley et al. (1989).

McAuley et al. (1989) used American college students as participants. It was found in internal consistency studies for Australian adolescents, reported in Chapter 3, that some items were ambiguous, while the pressure/tension scale appeared to be irrelevant in a non-competitive task. Consequently, some changes of wording were made and the tension subscale was omitted. Also, one item was excluded from the perceived competence subscale, because of its low correlations with other items on that subscale. When this item was omitted the subscale alpha coefficient increased substantially. The final 11 item IMI scale is presented in Table 4.3. The scores on this version vary from a minimum of 11 to a maximum score of 77.

Table 4.3

Ryan's Intrinsic Motivation Inventory (IMI) Modified For Basketball Free Throw Shooting with Australian Adolescents.

1. I enjoyed doing basketball shooting. (Interest-Enjoyment)
2. I think I am good at basketball shooting. (Competence)
3 I thought basketball shooting was interesting. (Interest-Enjoyment)
4 After doing basketball shooting for a while I felt pretty skilful. (Competence)
5. It was important to me to do well at basketball shooting. (Effort)
6. Doing basketball shooting was fun. (Interest-Enjoyment)
7. I tried hard at doing basketball shooting. (Effort)
8. This basketball shooting activity was enjoyable. (Interest- Enjoyment)
9. I am quite skilled at doing basketball shooting. (Competence)
10. I tried to do my best at basketball shooting. (Effort)
11. I could do the basketball shooting well. (Competence).

The alpha coefficients of subscales are 0.81 for Interest, 0.89 for Competence, and 0.73 for Effort. Internal consistency of the whole subscale is 0.90, indicating high internal consistency.

The process whereby this 11 item scale was derived is reported fully in Chapter 3 of this thesis. It should be noted that while the processes employed in the modification of the IMI were appropriate, some question must exist as to the nature of the modified scale that is, whether it should be referred to as a "modified" version of the IMI, following such substantial changed from Ryan's (1982) original and even from the 16 item version of McAuley et al (1989).

4.3.3.4. Procedure.

After receiving permission from the physical education teacher in each of the two schools to conduct this research, students in relevant physical education classes were told the purpose of the study and asked to participate in this study if they wished. To avoid disappointment and resentment and any consequent effects on experimental behaviour the Experimental Group and Control Group were selected from different schools after initial treatment. Therefore, only one group was utilised in each school. Both schools were state government co-educational and were located in similar working class areas; their pupils included a high percentage of Vietnamese migrants.

Occasion one: Participants entered the gym individually and received the instructions listed in Appendix 1. They were invited to take up the shooting position from behind a specified line, four metres from the basketball court's back line and perpendicular to the backboard. The experimenter then outlined the procedure as follows "You will be allowed four practice shots, then your twenty test shots." Upon completion of twenty test trials each participant was advised of the total number of baskets scored, ie; "You scored baskets out of twenty". Participants were then asked to complete the IMI questionnaire. They were then thanked for their participation in this research and invited to leave the gym.

Occasion two: Two weeks after pre testing was completed participants who gained a score greater than 44 on the first IMI test were invited to participate in the other two sessions of the experiment. When those participants who accepted this offer returned to the gym, participants were divided into two groups one in each of the two schools. The Experimental group were told prior to the experiment that a reward of fifty cents would be given if their previous performance at goal throwing was surpassed. ie, for each additional basket beyond the tally of the previous goal score they would received fifty cents. The experimenter told the Control group that the experimenter wanted to ascertain whether their ability to perform had improved. The procedure for all participants on this occasion was then explained. Participants were told that on this occasion they would complete a perceived competence test (Vallerand & Reid, 1984), and the IMI test, before and after basketball free throw shooting. The Perceived Competence and IMI items were then administered in that order. Those in the experimental group were then told about the reward as follows "You will received 50 cents for each basket you score more than your total last time, which was X." Participant then performed four practice and 20 test shots. The extrinsic rewards were given to those in the Experimental group who recorded higher than previous scores. No reward was offered or given to Control group participants. The Perceived Competence and IMI items were again administered in that order. Both groups were thanked for their participation and invited to leave the gym.

Occasion three: Participants returned to complete the final test session after an elapsed period of three weeks, sufficient time for cognitive processes to work on previous performance scores. On this occasion of testing the methodology was the same as for the Control Group on Occasion Two, thus no rewards were offered or given to the Experimental Group on this occasion. Each participant completed a Perceived Competence Scale and the IMI in that order, both before and after basketball free throw shooting. The researcher debriefed and thanked the participants for participating in this research and they were invited to leave the gym.

4.4. Results

4.4.1. Analysis of Variance (MANOVA and ANOVA).

A Multivariate Analysis of Variance (MANOVA) indicated main effects for performance, perceived competence and intrinsic motivation ($p<0.05$). Three univariate ANOVAS were then executed, one on performance, the second on perceived competence, and the third on intrinsic motivation to examine main effects of age, sex, treatment and occasion and their interaction. Results for each dependent variable are presented separately. In the Univariate analysis of variance used in this and the second study, one of the assumption is the requirement of sphericity which is tested using Mauchly's test (Norusis, 1993). When this test is significant to obtain correct results both the numerators and denominator degrees of freedom of the appropriate F test are multiplied by on adjustment factor, called the Huynh - Feldt epsilon. All p values quoted for the within subject effects are based on this correction.

4.4.2. Performance

A four way univariate analysis of variance was executed with three independent groups factors, age, sex and treatment each with two levels, and three levels of the repeated measure variable, occasion. Follow up analyses using Scheffe's post hoc test were executed, using a significance level of 0.05.

The means and standard deviations for performance of all groups on all occasions are presented in Table 4.4. Performance of Experimental Groups improved more between Occasion 1 (M=45.37) and Occasion 2 (M=47.70) as opposed to Occasion 2 and Occasion 3 (M=48.85). The exception was the Male Year 10 Experimental Group, where performance was much higher on Occasion 1 than in any other Experimental Group. Performance in the Male Year 10 Control Group was even higher on this occasion, suggesting that Year 10 Males were generally more skilled at this task, or that the fifty cents paid to the older males as a reward for each basket was not so highly valued. It appears that the fifty cents did not act as an adequate incentive for males to enhance their performance. Improved performance between Occasion 1 and Occasion 2 was lower than between Occasion 2 and Occasion 3 for Year 10 Males in the Experimental Group. Performance for Control Groups did not change markedly across Occasions. The only exception was the Year 7 Female

From Table 4.5, it is evident that males scored higher than females overall. Analysis of Variance revealed that there was a significant main effect of sex ($F(1,139)=110.33$, $p<0.0001$). This confirms the difference between males and females in performance, indicating that males outperformed females. A keen interest was shown by both gender groups.

Table 4.4.

Means and Standard Deviations by Sex, Age, Treatment and Occasion for Basketball Free Throw Shooting Performance (N=147)

Group	Size(N)	Occasion					
		Occasion 1		Occasion 2		Occasion 3	
		Mean	SD	Mean	SD	Mean	SD
Males Year 7							
Experimental	16	45.50	1.55	49.94	2.77	50.88	2.58
Control	21	46.29	3.78	47.71	2.26	48.67	2.48
Males Year 10							
Experimental	18	49.22	3.59	50.61	2.57	52.44	3.54
Control	18	50.22	3.23	50.11	3.38	50.78	2.65
Females Year 7							
Experimental	15	42.00	4.11	47.53	2.90	48.20	2.83
Control	17	40.12	4.40	42.06	3.19	44.18	3.05
Females Year 10							
Experimental	20	44.85	2.13	44.85	3.27	49.75	2.27
Control	22	44.77	2.69	44.86	2.51	45.95	2.08

_ This was especially evident in males. The means for intrinsic motivation also indicate this. The male mean for intrinsic motivation was M=56.35, and the female mean was M=53.36 on a scale where 77 was the maximum score and where 11 was the minimum. Control group. The performance mean for this group increased by two points from Occasion 1 to Occasion 2 and again from Occasion 2 to Occasion 3. It should be noted that this group was lowest in performance at all three stage of the study. Some improvement with practice is thus not surprising. Examination of the standard deviations indicated that there was not a high degree of variability within groups. As performance within each group was relatively consistent, following analyses consider only the means to examine differences between groups and across occasions.

The results in Table 4.6 show that the mean performance score for Year 10 students in general was higher than Year 7 students. Univariate analysis confirmed a significant main effect for age ($F(1,139)=39.23$, $p<0.001$). This result was predicted based on increases in general ball throwing and shooting skill with greater experience as children get older, as well as on likely greater experience of basketball specifically.

Being taller and stronger may also have helped older participants reach the standard height basketball ring more easily.

Table 4.5.

Mean Performance Scores for Males and Females (N = 147)

Sex	Size (N)	Mean	SD.
Males	73	49.36	2.86
Females	74	45.26	2.95

Table 4.7 shows that the mean performance score for the Experimental Group was higher than that of the Control Group. Univariate analysis showed a significant main effect of rewards on basketball free throw shooting ($F(1,139)=26.32$, $p<0.001$).

Table 4. 6

Mean Performance Score for Year 7 and Year 10 Students (N = 147)

Year	Size (N)	Mean	SD.
Year 10	78	48.53	2.82
Year 7	69	46.09	2.99

When it is considered that scores reflect performance on three shooting test and two of these followed reward, these result are in line with the hypothesis that extrinsic motivation positively affected performance.

The mean performance score for each occasion presented in Table 4 .8 shows an increase for all groups in performance from Occasion 1 to 2 and from Occasion 2 to 3. Univariate Analysis of Variance confirmed this difference to reflect a significant main effect of occasion (F (2, 278) =94.52, p<0.0001).

Table 4.7.

Mean Performance Score for Experimental and Control Groups (N =147)

Group	Size (N)	Mean	SD
Experimental	69	48.31	2.84
Control	78	46.31	2.96

A post hoc comparison using Scheffe's test indicated a significant difference between Occasion 1 and 2 and between Occasion 2 and 3 ($p<0.05$). It is possible that there was a practice effect for the sample as a whole since few of the females and younger males had experience of basketball at school.

Table 4.8.

Mean Performance Score for Occasion 1, 2 and 3 (N = 147)

Occasion	1	2	3
Means	45.37	47.70	48.85

Table 4.9 shows mean differences in performance between males and females. It appears that males in both Experimental and Control Groups outperformed females, but the difference between Male Reward and Control Groups was small, whereas rewarded Females clearly outperformed their non rewarded colleagues. The univariate analysis of variance shows an interaction effect of sex by treatment such that females showed a greater increase in performance in response to the extrinsic rewards than did Males ($F(1,139)=156.90$, $p<0.0025$).

Table 4.9.

Mean Performance Score for Males and Females in the Experimental and Control Group (N = 147)

Group	Size (N)	Experimental	Control
Males	73	49.76	48.96
Females	74	46.86	43.65

Table 4.10 shows that the mean performance for both males and females respectively increased over the three occasions. A weak but significant interaction effect of sex by time was revealed by the univariate ANOVA (F (2, 278)= 3.34, $p<$ 0.0464). A Scheffe's post hoc test revealed a significant increase in performance for Males from Occasion 1 to 2 but not 2 to 3 ($p<0.05$). A significant difference in performance was revealed for the Females across Occasion 1 and 2 and Occasion 2 to 3 ($p<0.05$).

Table 4.10

Mean Performance Score for Males and Females on Occasion 1, 2 and 3 (N = 147)

Sex	Size (N)	1	2	3
Males	73	47.80	49.59	50.69
Females	74	42.93	45.82	47.02

Figure 4.1 illustrated that it appears the mean of performance for the females improved more between Occasion 1 and 2 in comparison with that of the males. The less improved mean performance for males may be due to a ceiling effect.

Table 4.11 shows an increase of mean performance score for both age groups over time. The interaction of age and time was significant ($F(2,147)=10.15$, $p<0.0002$). Scheffe's post hoc test revealed that for Year 10 students there was a significant difference between Occasion 1 and 2 and between Occasion 2 and 3. On the other hand for Year 7 students there was a significant difference from Occasion 1 to 2 but no change from Occasion 2 to 3. In other words, the performance of Year 10 students improved from pre-test to rewarded test and from this to delayed post test, while the performance of Year 7 students improved substantially from Occasion 1 to 2 but not significantly from Occasion 2 to 3.

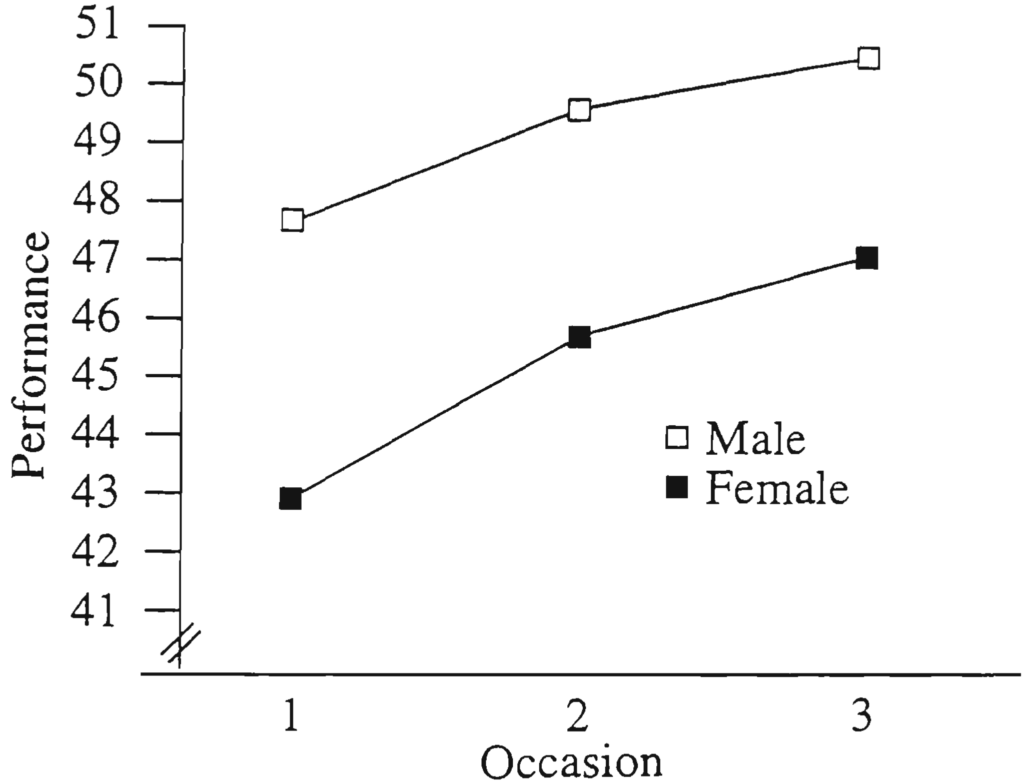


Figure 4.1: Mean performance for males and females on occasion 1, 2 and 3.

Table 4.11.

Mean Performance Score by Age and Occasion 1, 2 and 3 (N = 147)

Year	Size (N)	1	2	3
Year 10	78	47.26	48.60	49.73
Year 7	69	43.47	47.10	47.98

As can be viewed in figure 4.2, it appears that the mean performance for the Year 7 students was significantly more improved between Occasion 1 and 2 as compared to that of the Year 10 students, but Year 7 performance was much inferior on the first Occasion. Year 10 students always performed better, but Year 7 showed the rapid earlt rise typical of learning curve for novices. Also this level for both was at least maintained between Occasion 2 and 3.

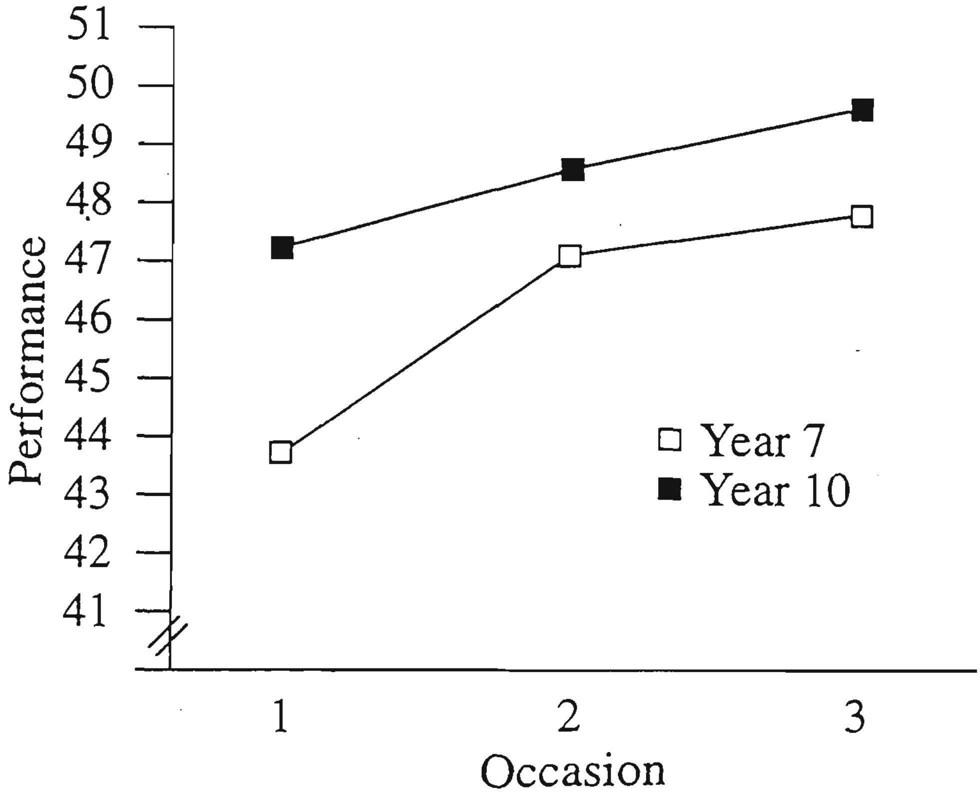


Figure 4.2: Mean performance difference by age and occasion 1, 2 and 3.

Table 4. 12 presents mean performance scores comparing the Experimental Group and the Control Group over occasions. The mean performance scores for the Experimental Group improved greatly between Occasion 1 and 2 and marginally between Occasion 2 and 3. Change in mean performance scores for the Control Group was also evident across time but less noticeable. Analysis of Variance confirmed an interaction effect of treatment by occasion ($F(2, 278)=9.45$, $p<0.0001$). Scheffe's post hoc test revealed significant differences for both Experimental and Control groups across all occasions ($p<0.05$). It is possible that these results are due at least in part, to a practice effect and not necessarily the treatment effect. A much larger difference was evident in the Experimental Group between Occasion 1 and 2 than for any other comparison, suggesting that a treatment effect might be present as well as the practice effect.

The two forms of interaction between occasion and treatment are presented in fig 4.3. The graph suggests that when a reward was given that is between Occasion 1 and 2, the mean performance increased significantly more for the Experimental group than the Control group.

Table 4.12.

Mean Performance Score for Experimental and Control Group on Occasion 1, 2 and 3 (N = 147)

Group	Size (N)	1	2	3
Experimental	69	45.39	49.23	50.01
Control	78	45.35	46.18	47.40

To examine the important question of whether reward (treatment) enhanced performance further analysis was carried out on the change in performance scores between occasions. Table 4.13 presents the change in performance scores between consecutive Occasions for Experimental and Control conditions. The increase in performance for the Experimental group from Occasion 1 to Occasion 2 is substantially higher than the other changes.

A Scheffe post hoc test revealed that the change in performance for the Experimental group from Occasion 1 to 2 was significantly larger than the change in performance for the Control group from Occasion 1 to 2, the change in performance for the Experimental group from Occasion 2 and 3 and the change in performance of the Control Group from Occasion 2 to 3, supporting the proposition that a treatment effect was present on Occasion 2 for the Experimental Group.

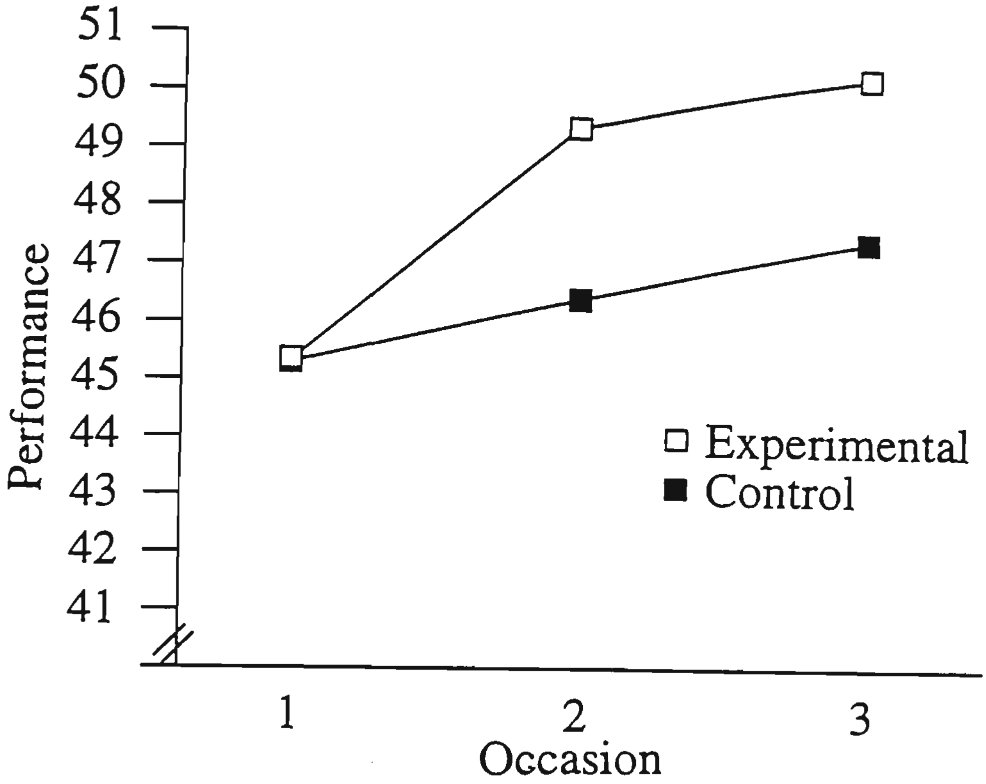


Fig 4.3: Mean performance difference for experimental and control group on occasion..

As can be seen in fig 4.4, the difference in means between the Experimental and the Control group was greater for the Occasion 1 to 2 change, than for the Table 4. 13.

Changes in Mean Performance Score from Occasion 1 to Occasion 2 and from Occasion 2 to Occasion 3 for Experimental and Control Groups (N = 147)

		Occasions	
Group	Size (N)	1 - 2	2 - 3
Experimental	69	3.84	1.84
Control	78	0.83	1.22

Occasion 2 to 3 change. The change for both groups was similar between occasion 2 and 3.

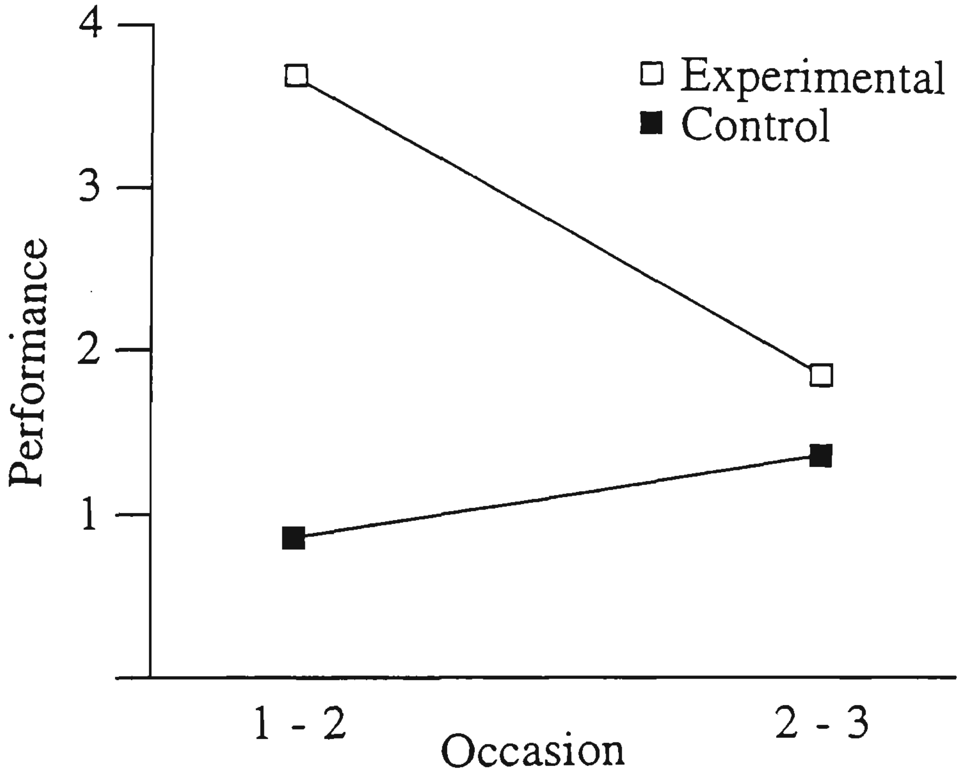


Figure 4.4: Changes in mean performance difference from Occasion 1 to Occasion 2 and from Occasion 2 to Occasion 3 for Experimental and Control Group

It is illuminating to examine these differences in terms of the effect size concept developed by Cohen (1988). Using the estimated within subject standard deviation the difference in means between the experimental and control group for occasion 1 to 2 change has an effect size of .54, which Cohen calls "medium" size effect ; while the occasion 2 to 3 change has an effect size of .11, which is quite a small size effect given that Cohen describes effect sizes of .02 as "small". In summary, performance was significantly affected by age ($F(1,139)=39.23$, $p<0.0001$), and sex ($F(1,139)=110.33$, $p<0.0001$), older participants and males typically producing superior basketball shooting performance. There was also a main effect for treatment ($F(1,139)=26.32$, $p<0.0001$) indicating that performance was higher in the group offered reward. The interaction of sex by treatment was also significant ($F(1,139)=9.47$, $p<0.0025$). However, performance was not significantly affected by the interaction of age and sex ($F(1,139)=0.01$, $p>0.05$). The results suggest a weak association between age and performance, a moderate association between sex and performance and a main effect of treatment, such that the rewarded groups performed better overall. The interaction of sex by treatment suggests that females improved more than males after treatment. The main effect of occasion ($F(2,139)=94.52$, $p<0.0001$), indicated that performance improved from Occasion 1 to 2 and 2 to 3, suggesting a practice effect. The interaction of treatment by occasion ($F(2,278)=94.52$, $P<0.0001$) showed that the improvement was significant for the rewarded and the non rewarded participants from Occasion 1 to 2 and from Occasion 2 to 3 indicating a practice effect. Further, analyses of change in performance scores, indicated that the treatment had an effect on performance of the Experimental Group from Occasion 1 to Occasion 2 over and above any practice effects.

4.2.3. Perceived competence

A four way repeated measures Univariate Analysis of Variance (ANOVA) was executed (2x2x2x4) with three independent variables age, sex, and treatment each with two levels and one repeated measure, occasion, with four levels. Participants responded to the Perceived Competence scale before performance 2 (B2), after performance 2 (A2), before performance 3 (B3) and after performance 3 (A3).

Table 4.14 summarises the means and standard deviations for the perceived competence scale T across four occasions for all groups. The mean of perceived competence for the Experimental Groups improved greatly after treatment and remained elevated. Perceived competence for the Control Groups remained static on the whole. The perceived competence of the Year 10 Male Control Group showed an uncharacteristic increase on the final occasion. The perceived competence of the Year 10 Female Control Group remained at a relatively low level. A similar comment regarding the standard deviation can be made for perceived competence as for performance, that is, there was not a high degree of variability within group.

Table 4. 14.

Means and Standard Deviations by Sex, Age, Treatment and Occasion for Perceived Competence for Basketball Free Throw Shooting (N =147)

Group	Size (N)	Occasion							
		1		2		3		4	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Males Year 7									
Experimental	16	4.00	1.10	5.19	1.11	5.06	1.39	5.31	1.25
Control	21	4.52	0.98	4.52	1.17	4.62	1.16	4.86	1.16
Males Year 10									
Experimental	18	3.94	1.26	4.67	0.84	4.56	1.46	4.78	1.17
Control	18	3.89	0.76	3.94	0.76	3.61	0.78	4.50	1.42
Females Year7									
Experimental	15	4.13	0.99	5.13	0.99	5.40	0.91	5.40	1.06
Control	17	4.24	1.09	4.29	1.16	4.18	1.13	4.29	0.99
Females Year 10									
Experimental	20	3.20	1.15	4.10	0.79	4.10	0.97	4.20	0.70
Control	22	3.82	1.05	3.59	1.14	3.86	1.08	4.05	1.17

Table 4. 15 shows that the mean perceived competence of Year 7 students was higher than that of Year 10 students. Analysis of Variance revealed a significant main effect of age ($\underline{F}(1,139)=25.58$, $\underline{p}<0.001$). The overall performance mean for Year 10 students was much higher than that for Year 7 students. This suggests that the perceived competence of Year 7 students increased much more than the perceived competence of Year 10 students.

Table 4. 15

Mean Perceived Competence for Year 7 and Year 10 students (N =147).

Year	Size (N)	Mean	SD
Year 7	69	4.681	1.09
Year 10	78	4.301	1.37

The mean perceived competence for the Experimental and Control groups are presented in Table 4.16. Perceived competence of the Experimental group was significantly higher than that of the Control group. Univariate Analysis of Variance revealed a significant main effect for treatment ($\underline{F}(1,139)=9.75$, $\underline{p}<0.0022$), suggesting that the Experimental Group was associated with higher perceived competence throughout the study.

Table 4. 16.

Mean Perceived Competence Score for Experimental and Control Group (N = 147).

Group	Size (N)	Mean	SD
Experimental	69	4.525	1.07
Control	78	4.173	1.05

Table 4. 17 shows the means of perceived competence over the four occasions. The only large improvement in perceived competence was from Occasion 1 to Occasion 2. Analysis of variance revealed a significant main effect of time ($F(3,137)=4.4478$, $p<0.001$). Scheffe's post hoc test showed a significant difference between Occasion 1 and 2, but not between Occasion 2 and 3, and between Occasion 3 and 4. This indicated that during the 3 weeks break between Occasion 2 and Occasion 3, perceived competence did not change, nor did it change on Occasion 4 of testing. .

Table 4.17.

Mean Perceived Competence Score for Occasion 1, 2, 3 and 4 (N = 147).

Occasion	1	2	3	4
Mean	3.94	4.40	4.40	4.64

Table 4. 18 presents the means for the Experimental Group compared to the Control Group, reflecting the interaction effect of treatment over time. The increase between Occasion 1 and 2 is much larger in the Experimental Group with no similar increase in the Control Group. A significant interaction of treatment by occasion was revealed by Analysis of Variance ($F(3,417)=10.67$, $p<0.0001$). Scheffe post hoc tests revealed that perceived competence in the Experimental Group was enhanced significantly on the second occasion when the extrinsic reward was offered and was maintained over occasions, whereas the Control Group did not show any significant difference.

Table 4.18.

Mean Perceived Competence Score of the Experimental and Control Groups for Occasions 1, 2, 3 and 4 (N = 147).

Group	Size (N)	1	2	3	4
Experimental	69	3.872	4.726	4.724	4.869
Control	78	4.115	4.076	4.076	4.423

For perceived competence the interaction between treatment and occasion is represented in Fig 4.5. The graph shows that the Experimental Group mean increased significantly more for perceived competence between Occasion 1 and 2 in comparison with the level of the control group for perceived competence. On the other occasions, of little change pattern was maintained for both groups, except for an increase for the Control Group on Occasion 4, which was not expected.

In summary, perceived competence was significantly influenced by the between group factors of age ($F(1,139)=25.58$, $p<0.0001$), and treatment ($F(1,139)=9.75$, $p<0.0022$), and the within groups factor of occasion ($F(3,137)=14.14$, $p<0.0001$), while the main effect of sex ($F(1,139)=3.80$, $p<0.0531$) was marginal. However, the Scheffe post hoc tests revealed only Occasion 1 and 2 to be significant for all these effects. The main effect of age indicated that Year 7 students felt more competent, which might be related to their perception of greater improvement in their performance. The marginal effect of sex suggested that males were a little more challenged than females by this basketball task. The most important result was the significant interaction effect of treatment and occasion ($F(3,417)=10.67$, $p<0.0001$). The large increase in perceived competence from Occasion 1 to 2 indicated a strong effect on perceived competence of the introduction of the monetary reward.

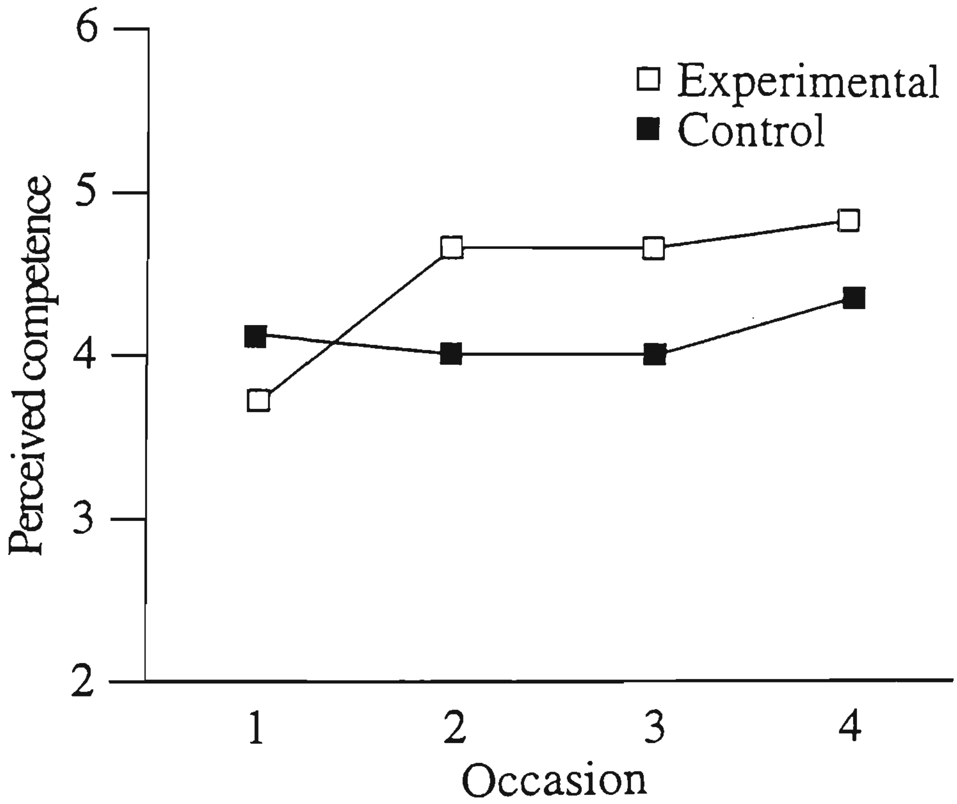


Figure 4.5: Mean perceived competence difference of the experimental and control group for Occasion 1, 2 and 3.

4.2.4. Intrinsic Motivation

Univariate four way Analysis of Variance was executed for scores on the modified Intrinsic Motivation Inventory (2x2x2x5), with three between participants factors, namely sex, age, and treatment, with two levels each, and one within participants factor, occasion with five levels over the testing period.

ble 4.1Ta9. Means and Standard Deviations by Sex, Age, Treatment and Occasion for Intrinsic Motivation for Basketball Free Throw Shooting (N = 147)

Group	N	Occasion									
		A 1		B 2		A 2		B 3		A 3	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Males Year 7											
Experimental	16	54.31	6.73	52.19	8.44	59.44	7.14	60.25	7.27	60.94	7.15
Control	21	53.71	6.56	55.43	7.65	55.38	7.51	55.86	7.56	57.95	6.73
Males Year10											
Experimental	18	54.78	6.97	55.06	6.66	62.83	7.11	62.17	6.97	61.56	5.61
Control	18	51.56	6.64	52.00	7.81	52.78	8.86	54.11	7.08	55.78	6.30
Females Year 7											
Experimental	15	51.07	8.66	52.27	8.13	56.13	6.28	55.07	6.16	55.93	6.28
Control	17	47.47	3.37	47.76	5.25	50.88	4.88	52.29	5.75	53.24	5.19
Females Year10											
Experimental	20	49.75	4.96	50.75	5.21	59.95	5.78	61.65	4.82	61.20	6.1
Control	22	50.68	4.89	49.82	6.66	53.14	5.87	53.32	7.34	54.14	7.49

1

The means and standard deviations for the Intrinsic Motivation Inventory (IMI) scores are presented in Table 4.19 for all groups and all occasions. Participants completed the IMI on five occasions, after performance 1, before performance 2, after performance 2, before performance 3, and finally, after performance 3. Each mean of intrinsic motivation for Males was higher than the corresponding mean for Females. However, for both Males' and Females', Experimental Group means were superior to Control Group means. Treatment affected the means of all Experimental Groups. There were substantial increases in the means of the Experimental Groups between Occasion 2 and 3. After this increase, means for these groups were maintained at the same levels. Means of all Control Groups remained at the same level across all five occasions with minor variations. The standard deviations for intrinsic motivation were relatively small compared to their corresponding means and, hence, only means are presented in future table.

Table 4.20 shows that the mean intrinsic motivation of Males was greater overall than that of Females. Analysis of Variance revealed a significant main effect for sex ($\underline{F}(1,139)=10.82$, $\underline{p}<0.0013$). This indicates that Males had significantly higher intrinsic motivation across the study as a whole.

Table 4.20

Mean Intrinsic Motivation Score for Males and Females (N = 147)

Gender	Size (N)	Mean	SD
Males	73	56.34	7.13
Females	74	53.26	5.95

Table 4.21 shows that the mean intrinsic motivation for the Experimental Group was larger than that of the Control Group. There was a highly significant main effect of treatment ($F(1,139)=18.26$, $p<0.0001$), as indicated by Analysis of Variance, confirming that the Experimental Group had significantly higher intrinsic motivation than the Control Group over the study as a whole.

Table 4.21.

Mean Intrinsic Motivation Score for the Experimental Group and the Control Group (N = 147)

Group	Size (N)	Mean	SD.
Experimental	69	56.26	6.62
Control	78	52.86	6.46

Table 4.22 shows that mean intrinsic motivation greatly increased between Occasions 2 and 3 and increased little subsequently. Analysis of Variance indicated a highly significant main effect of occasion ($F(4,136)=5.14$, $p<0.0001$). A Scheffe's post hoc test was applied to determine which occasions were significantly different. It revealed that the statistical differences between Occasion 2 and 3 and Occasion 4 and 5 were significant ($p<0.05$) in the level of the increase of intrinsic motivation. The comparisons for all other occasions were found to be not significant. The increase between Occasion 4 and 5 is much smaller than the increase between Occasion 2 to 3. It might be related to performance increase, especially the practice effect in the Control Group.

Table 4. 23 indicates that the means of the Experimental Group improved greatly after the treatment, that is, from Occasion 2 to 3 and remained the same across Occasions 3, 4, and 5, whereas the means of the Control Group increased progressively but slightly over time.

Table 4.22.

Mean Intrinsic Motivation Score for Occasions 1, 2, 3, 4 and 5 (N=147).

Occasion	1	2	3	4	5
Mean	51.66	51.91	56.31	56.84	57.97

Analysis of Variance revealed a significant interaction effect of treatment by occasion ($F(4, 556)=16.54$, $p<0.001$). A Scheffe's post hoc test was executed confirming a significant difference between Occasion 2 and 3 ($p<0.05$) for both Experimental and Control groups. Comparison of Occasions 1 and 2, 3 and 4, and 4 and 5 proved to be not significant for either group.

The interaction between treatment and occasion is represented in Fig 4.6. The mean of intrinsic motivation for the Experimental Group had a significantly greater increase between Occasion 2 and 3 than that of the Control Group. After this period, there appears to be no further change for the Experimental Group, while the Control Group shows small increases on each occasion of measurement, but remains well below the Experimental Group difference between both groups.

The four way univariate ANOVA revealed a three way interaction for age by treatment by occasion. Table 4.24 indicates that the intrinsic motivation for Year 7 and Year 10 participants in the Experimental Group showed little variation from Occasion 1 to 2, large increases in intrinsic motivation from Occasion 2 to 3, and little variation from Occasion 3 to 4 or 4 to 5.

Table 4.23.

Mean Intrinsic Motivation Score for Experimental Group and Control Group over Occasions 1 to 5 (N=147)

Group	Size(N)	1	2	3	4	5
Experimental	69	52.47	52.67	59.59	59.79	59.90
Control	78	50.68	51.26	53.05	53.89	55.28

The increase from Occasion 2 to 3 was larger for Year 10 participants although there was little difference in intrinsic motivation level on Occasion 1 to 2.

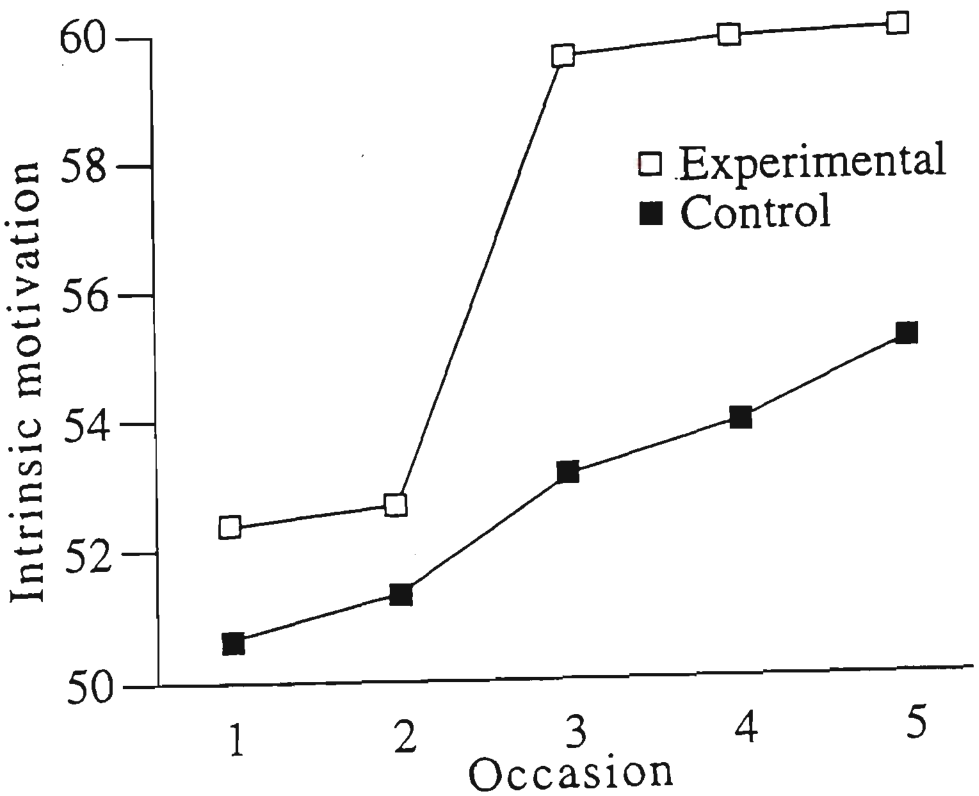


Figure 4.6: Mean instrinsic motivation difference for experimental and control group over occasions 1 to 5.

For the Control participants, both Year 7 and Year 10 group showed systematic, but small increases in intrinsic motivation from Occasion 1 through to Occasion 5.

The overall increase is a little larger for Year 7 (Increase=5.0) than for Year 10 participants (Increase=3.84). A Scheffe post hoc test confirmed that the Occasion 2 to 3 difference for the Experimental Group overall was significant ($p<0.05$), while no other consecutive comparison reached significance. Similarly, no consecutive comparison reached significance ($p<0.05$) for Control Group participants, but intrinsic motivation for Occasion 5 was significantly higher than Occasion 1 for the Year 7 Control Group only.

Table 4.24.

Means for Intrinsic Motivation by Age, Treatment and Occasion (N=147)

Year	Size (N)	Occasion				
		1	2	3	4	5
Year 7						
Experimental	31	52.69	52.23	57.79	57.66	58.44
Control	38	50.69	51.60	52.13	54.08	55.60
Year 10						
Experimental	38	52.27	52.91	61.40	61.91	61.38
Control	40	51.17	50.91	50.10	53.37	54.96

Figure 4.7 represents the three-ways interaction between age, treatment and occasion. The graph shows that the mean of intrinsic motivation between Occasion 2 and 3 had a greater increase.

This was significant in comparison with the other occasions. The mean of intrinsic motivation for the experimental group also had a greater increase than that of the Control Group.

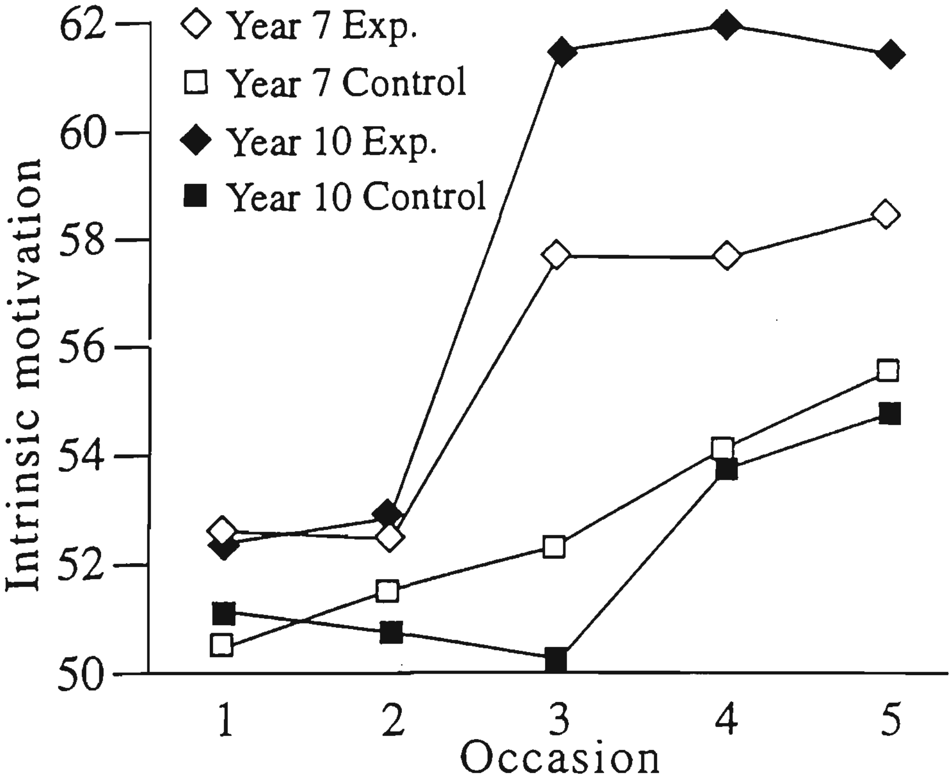


Figure 4.7: Mean for intrinsic motivation by age, treatment and occasion.

This higher level of intrinsic motivation were maintained on Occasion 4 and 5. The significant three way interaction appears to be relate to the low results achieved for the year 10 control group between occasion 2 and 3, and the larger increase between occasion 2 and 3 for year 10 experimental group than for the year 7 experimental group.

Referring to Table 4.19 presented earlier, presents the means for age, sex, treatment and occasion are illustrated for all group separately. The mean of intrinsic motivation for Males irrespective of age and treatment is higher than that of the Females. The mean of intrinsic motivation for the Experimental Group for both sexes is higher than that of the Control Group. However, in the Control Group, females of both ages increased intrinsic motivation more than Males of both ages between Occasion 2 and 3. Univariate Analysis of Variance revealed a significant four way interaction effect of age by sex by treatment by occasion ($F(4,556)=4.05$, $p< 0.0084$). Scheffe's post hoc test confirmed this interpretation.

In summary, overall, intrinsic motivation was significantly affected by sex ($F(1,139)=10.82$, $p<0.003$), treatment ($F(1,139)=18.26$, $p<0.0001$) and occasion ($F(4,136)=5.14$, $p<0.0001$). Significant interaction effects were revealed for treatment by occasion ($F(1,4)=16.54$, $p<0.0001$), age by treatment by occasion ($F(4, 556)=3.02$, $p<0.0316$). and age by sex by treatment by occasion ($F(4,556)=3.02$, $p<0.0316$). However, there was no significant main effect for age. The main effect of sex indicated that intrinsic motivation for the task was higher for males than for females. Females' intrinsic motivation was however, lower than that of the males in the baseline test, suggesting that males typically find basketball shooting more interesting than females. The main effect of treatment favouring the rewarded group might be related to introduction of the reward. This was tested by the interaction between treatment and occasion, which confirmed the strong influence of rewards on intrinsic motivation of the Experimental Group. The significant difference for occasion was also clarified by this interaction to be due to the effect of treatment on the Experimental Group on Occasion 3. Interaction of age by treatment by occasion suggests that younger students were more affected by the treatment between Occasion 2 to 3 than older students, that is, the reward had a larger immediate effect on younger children.

4.4. Summary of ANOVA Results

To summarise the ANOVA results for this experiment, the three dependent variables of performance, perceived competence and intrinsic motivation were significantly affected by between group main effects of age, gender and treatment and within group occasion main effects. The results indicate that when monetary reward was given, performance, perceived competence and intrinsic motivation increased significantly. Unlike previous research, it is noticeable that the level of performance, perceived competence and intrinsic motivation were maintained in the absence of the reward. It is possible that the practice effect may contribute to their sustained high levels. The main effect of age on performance and perceived competence suggested that the mean of performance in the older (Year 10) students, with greater physical strength and more experience overall was significantly higher than that of the younger (Year 7) students. However, the mean of perceived competence in the younger (Year 7) students was significantly higher than that of the older (Year 10) students. It appears that younger adolescents may tend to attribute their performance to effort whereas older adolescents may tend to attribute their performance to ability (Nicholls, 1984a). There was also a practice effect which may have contributed more to the level of perceived competence in the younger students, because the younger students appeared to learn more quick than the older students. The significant interaction of age by treatment and occasion suggested that the intrinsic motivation of younger students is likely to be affected immediately by the reward. It could be that although the older students produced superior performance or all occasions, the big increase in performance of the younger students from Occasion 1 to 2, which is shown in Figure 4.2, had a strong effect on their perceived competence. The mean of performance and intrinsic motivation for males was significantly higher than that of females, suggesting that, because males have more physical strength and are more interested in this task. They perform better and show greater intrinsic motivation. It is noticeable that when extrinsic reward was given, the performance of females improved significantly more than that of the males even though the overall mean of performance in males was higher than that of females. This raises the possibility that the performance of males may have reached a ceiling effect whereas the progress of females appear to continue, because it started from a lower base.

4.5. Discussion.

The results of the present study examining the effect of monetary rewards on basketball free throw shooting of secondary school students, showed that the extrinsic reward motivated students, producing substantial increases in performance, perceived competence and intrinsic motivation, which were significantly greater than any increases in the control group. This appears to be contradictory to Cognitive Evaluation Theory (Deci 1975) which predicts that extrinsic reward will decrease intrinsic motivation when presented in a controlling manner. In other words, when the individual regards their behaviour as a means to an end, in this case, to get the monetary reward, the person feels externally controlled, self-determination is reduced and so, as a consequently is intrinsic motivation. It is possible, however, that this performance-contingent reward was not perceived primarily as controlling despite the very clear, contorlling instructions associated with it. It is possible that giving money for improved performance might have focussed attention on the standard of performance, thus emphasising the informational aspect. In addition, it might have made the subjects exert more effort to improve performance. Therefore, the informational aspect of the reward could have been more salient, rather than the controlling aspect, if the reward was clearly tied by subjects to their progress in the task.

To discuss the results of this study more closely the effect of reward on performance, perceived competence and intrinsic motivation considered in turn.

First, in refelecting on the inclusion of a genuine performance competent in this study, a reward that is perceived to be meaningful can greatly influence a person's performance in the short-term. As performance increases, however, the withdrawal of the reward may not necessarily reduce the future capacity to perform. For one thing, the learning of a skill-based task, leads to the person having increased their competence in performing the task and increased perceived competence, based on this increased actual competence, could sustain performance. Secondly, positive knowledge of results and the satisfaction, given by knowing skills improving could enhance performance.

Cognitive Evaluation Theory (Deci, 1975, Deci & Ryan 1980,1985) and Overjustification (Lepper & Greene 1975) predict that intrinsic motivation for participating in enjoyable tasks may be undermined by introducing extrinsic reward when reward is perceived to be controlling behaviour. The present study, predicted that intrinsic motivation would decrease when extrinsic reward was introduced for an enjoyable task such as basketball free throw shooting. Deci (1975), however, does not consider the effect of the level of performance on intrinsic motivation. It can be argued that extrinsic reward is likely to improve performance, which, in turn enhances perceived competence and intrinsic motivation (Kamal, 1989; Rushall & Pettinger 1969). It is also possible that the extrinsic reward can affect the individual in two different ways, depending on their perception of the situation. Calder & Staw (1975a) suggest that a decrease in intrinsic motivation can be explained by subjects becoming oversatiated. In this case, the subject feels that they have repeated the task more than enough and the subject loses interest (Calder & Staw, 1975a). The second way that reward can affect the person is that it promotes improved performance at a task which leads to a sense of higher competence. Subjects receive positive, intrinsic feedback from improved performance, which leads to increased perceived competence and hence intrinsic motivation. It should be noted that the effect on intrinsic motivation is based on the mediating role proposed for perceived competence in Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan 1980, 1985) which has been supported by research by Vallerand and Reid, (1984, 1988)

Although Deci's (1975) Cognitive Evaluation Theory has explained the relationship between extrinsic rewards and intrinsic motivation well for many situations, the theory has not paid much attention to the effect of rewards on performance and the influence of enhanced performance on the level of intrinsic motivation. The present study used the questionnaire method and avoided the free choice approach with distractions, such as magazines or toys, as found in Deci's (1971) and Lepper & Greene's (1975) studies. In addition, it might be that basketball free throw shooting is more fun and more personally challenging than puzzle solving for students and drawing for children.

Rewards were presented in a manner where the controlling aspect was assumed to be highly salient in the present study. It is possible that the controlling aspect of monetary reward was not sufficient to influence the behaviour of the subjects in this study. This research (hypothesis 2) found that performance of basketball free throw shooting for the reward group increased significantly more after reward was offered than performance of the control group, who were not offered or given reward. This result shows that extrinsic reward did improve performance in the short term. In the long-term, however, Bandura, Reese & Adams (1982) found that improved performance depends not so much in the initial reward as on the perceived competence during the task itself.

Another possible explanation is that there are different kinds of extrinsic rewards. Task- non-contingent rewards reward participation in the activity regardless of performance of the task. This form of reward may not have a detrimental effect on performance (Deci, 1972a). Task-contingent rewards are given for actually doing or completing the task. This kind of reward typically impairs intrinsic motivation more than task-non-contingent rewards. Performance-contingent reward (Harackiewcz 1979; Ryan 1983) refers to reward given for attaining a specific level of performance. This form of reward is usually more controlling than the other reward contingencies. However, it can be argued that due to the information inherent in this form of reward, it is capable of improving performance. When an individual achieves a desirable performance, this reward acts as a positive factor, that is, the person perceives, in the amount of money rewarded, information about high competence. In the present study, performance-contingent rewards might also have had a less controlling effect partly because their size (50 cents per extra basket score) was not perceived as sufficiently large to control behaviour. Also, the students were told that reward was not contingent on attaining a fixed performance score, rather reward was depedent on amount of improvement compared to the previous attempt. This could have focused attention on information about improvement given by the reward. This finding is supported by Salancik (1975) who found that the effect of performance-contingent reward on intrinsic motivation depends on the level of performance. That is, in Salancik's study better performing subjects liked what they did whether paid or not, although they were more satisfied with their contribution to the task when paid. It is also possible that a reward of 50 cents per extra basket was not a great incentive to the subjects, but it did provide clear information, for example, being given $3 meant 6 extra baskets had been scored.

A short term improvement in performance is not very desirable if it is gained at the expense of a longer term decline in motivation. Among of the most crucial issues in this study is the relationship between reward, performance, perceived competence and intrinsic motivation in the longer term. In most previous research a further test was not administered after a delay period. Among the main aims of this study was to investigate whether performance increased, decreased or was maintained after a substantial delay and further, after actual removal of reward. The results of this study showed that performance, perceived competence and intrinsic motivation were maintained or even improved further in the delayed post test, three weeks after rewarded performance, and that perceived competence and intrinsic motivation were still maintained after performance, for which no reward was offered or given.

These are theoretically and practically crucial findings for psychologists, coaches and performers, in motivating athletes and improving performance. To explain these results theoretically, Cognitive Evaluation Theory (Deci, 1975) would suggest that offering an extrinsic reward may indicate information to the individual about improved performance, which increases the feeling of perceived competence. Thus, it is the relatively more salient informational aspect of reward which could increase or maintain performance. Also Lawler (1971) suggested that it seems extrinsic rewards heighten subjects' perception of their own competence and experience. Several other studies (Enzel & Ross, 1978; Feingold & Mahoney, 1975; Karniol & Ross, 1977; Thomas & Ternant, 1978) have provided additional evidence where extrinsic reward increased performance and perceived competence. It is also possible that extrinsic reward enhanced performance directly and subjects in the rewarded group, being aware of the large increase in their performance, perceived themselves to be more competent which increased their intrinsic motivation. With no contrary information during the three week break, perceived competence and intrinsic motivation were maintained three weeks later, while performance on that occasion provided information which confirmed the higher level of perceived competence, leading to perceived competence and intrinsic motivation being maintained in the final test. Further study and analysis is necessary in an attempt to clarfy the causal links between extrinsic reward, performance, perceived competence and intrinsic motivation. Causal modelling analysis of the present data is discussed in the next chapter.

Focusing on the consideration of finding for perceived competence, Deci (1975) proposed that perceived competence and the feeling of self-determination are closely related to intrinsic motivation. When individuals feel a desirable achievement or that they received positive feedback from a task, perceived competence increases, whereas when an individual feels they have failed or that they received negative feedback from a task, perceived competence decreases. This study revealed (hypothesis 3) that the level of perceived competence of the rewarded Experimental group increased significantly after reward was given and was significantly higher than that of the Control group. This is consistent with Bandura (1977) who suggested that an individual's performance is a source of self-efficacy information. He argued that better performance reflects higher self-efficacy. The result suggests that either a feeling of improved performance or extrinsic reward or a combination had a positive effect on perceived competence.

This study found that perceived competence improved more for the rewarded Experimental group than for the Control group immediately after reward was given (A2), and that the higher level of perceived competence was retained after a three week delay (B3) and after subjects performed again with no reward offered or given (A3). It is possible that improved performance in this same period affected perceived competence. It is difficult, however, to establish which had the greater influence, the reward or feedback from improved performance. In her work, Feltz (1982) found clear evidence from path analysis that self efficacy was a major predictor of performance on a task, but after the first trial, previous performance was a stronger determinant of self-efficacy. Vallerand and Blais (1986) found that evaluation of performance contributed to the strong effect on perception of competence which in turn led to changes in intrinsic motivation. They noted that the poorer was performance evaluation, the lower was the feeling of competence experienced.

Moving from consideration of perceived competence to look at intrinsic motivation, Cognitive Evaluation Theory (Deci 1975; Deci & Ryan 1980, 1985) predicts that offering of performance-contingent extrinsic rewards for the performance of intrinsically motivating tasks will decrease intrinsic motivation, especially when the reward is withdrawn. In line with this theory, extrinsic rewards are considered to have a considerable detrimental effect on intrinsic motivation. However, if extrinsic reward improved performance, the improved performance could mitigate the controlling effect of extrinsic reward which decreases intrinsic motivation. Also, increased perceived competence resulting from feedback from improved performance should increase intrinsic motivation. Many sports tasks involve such intrinsic feedback, that is, feedback which occurs as a natural part of the activity, such as seeing the tennis serve going in the service court, the soccer ball going in the goal or the basketball going through the ring, as in this study. Thus, such intrinsic feedback was available to the subjects. Performance scores did show a dramatic improvement for reward group subjects on Occasion 2, after offer of the reward, so an increase in perceived competence from feedback seems to be a plausible explantion. This link between perceived competence and intrinsic motivation is proposed by Cognitive Evaluation Theory and supported by Vallerand and Reid (1984, 1988)

This study (hypothesis 4) demonstrated that intrinsic motivation for basketball free throw shooting in the Experimental group increased significantly when reward was given. This suggests that subjects in the reward group received additional information from their improved performance, which caused them to feel more competent, thereby increasing intrinsic motivation. When an individual outperforms their expectation, this process may become self-reinforcing. This view is in contrast to the assumption that extrinsic rewards presented in a controlling manner will decrease intrinsic motivation. Cognitive Evaluation Theory (Deci 1975) is based on research investigating differences between baseline and a post-test period, ignoring the reward period itself and performance level. It can be argued that improved performance in this study, stimulated by extrinsic rewards, had a positive effect on perceived competence. The positive effect on perceived competence might have offset the controlling aspect of the extrinsic reward. Through, this process, intrinsic motivation could have been maintained or improved. This is not to say that CET is in error, but just to note that research has not adequately examined the complex relationships which might operate in challenging performance tasks.

This study found that perceived competence and intrinsic motivation were maintained or improved three weeks after the removal of the reward. It appears that subjects in the reward group felt an increased sense of competence following their performance, leading to increased intrinsic motivation and they maintained this sense after three weeks. Both groups improved marginally but not significantly in their performance between the intermediate test and the delayed posttest. Therefore, intrinsic motivation was not influenced by behaviour or experience during the three week delay. Results suggest that monetary reward, in this case, might have had little or no effect as a controlling influence, but acted as information about improved performance and thus, competence. This study indicates either that improved performance as a result of reward directly affected perceived competence or alternatively, that the reward improved perceived competence and improved performance independently. The increase in perceived competence would then be proposed as the basis for increased intrinsic motivation.

There was no significant difference between intrinsic motivation at the baseline testing and the testing of intrinsic motivation before performance two weeks later in the intermediate testing period. There was also no significant difference between the testing of intrinsic motivation after performance in the intermediate testing period and the test before the delayed post test period three weeks later. These findings suggests that intrinsic motivation was not affected by any extraneous factors.

Although Cognitive Evaluation Theory (Deci 1975) has examined the effect of extrinsic rewards on perceived competence and intrinsic motivation, there has been little study of variation of the effects of extrinsic reward on intrinsic motivation for adolescent aged individuals. Deci (1971; 1972a, b) mainly used undergraduate students and Lepper & Greene (1974) worked with children between the age of 3 to 5. None of these studies considered adolecence an important developmental stage in sport, as compared to young children and college students. Nicholls (1978) proposed that the concept of ability is perceived differently by individuals at different stages of their development. Under 13 years, subjects tend to believe that competence mainly depends on the amount of effort one puts into a task. However, over this age, subjects recognise that competence is more dependent on ability or capacity to do the task than on the amount of effort one puts into it. In order to examine the effect of extrinsic reward on intrinsic motivation for different age groups at this crucial stage of conceptional development, this research compared the performance of Year 7 and Year 10 students.

The present study (hypothesis 1) found that the performance of the younger students improved more during the intermediate period when the rewards were administered compared to the older students. Karmel (1981) also found that his younger subjects (age 13) improved more in their performance after reward than did his older subjects (aged 15). Harter (1981) suggests that older students are more intrinsically motivated whereas younger students are more affected by extrinsic reward. It is possible that younger students also comply more with teachers' demands and extrinsic motivation, coming from a teacher, is more powerful for them. In addition, younger students are less experienced and therefore there is potential for a greater learning effect. This may also cause younger students to increase their performance more than older students. As competence actually does increase, perceived competence and hence intrinsic motivation could be expected to increase. This study demonstrated that the interaction of age by time was significant for performance. Year 7 students when offered reward, improved performance significantly more when compared to Year 10 students. This shows that the effect of extrinsic reward on intrinsic motivation was greater for younger students than older students. There was also a significant main effect of age on perceived competence. Younger students' perceived competence was higher than that of older students, perhaps because younger students' pace of learning was faster although they had lesser previous experience and scored lower at the start. If that was the case, then possibly the perceived competence may have had a great effect on their performance.

The age of a subject may affect the level of intrinsic motivation for a specific task. However, there was no main effect of age on intrinsic motivation, indicating that over the whole study younger and older studens did not differ on intrinsic motivation, but this study found that there was a significant interaction of treatment by age and occasion. When extrinsic reward was given, intrinsic motivation of younger students in the Experimental group was significantly higher than that of older students. After the removal of extrinsic reward, the performance of younger subjects was maintained at the level of performance for the rewarded period. This might be because younger subjects tended to improve their performance as they exerted effort on the task. This subsequently raised their perceived competence and intrinsic motivation. However, they could not distinguish between ability and hard work in relation to judging the standard of their performance.

Previous research on gender differences in the relationship between intrinsic motivation and perceived competence, produced equivocal results, especially in relation to positive and negative feedback, but few studies have considered the role of performance. This study demonstrated that there were main effects for gender on performance, intrinsic motivation, and a marginal main effect for perceived competence. Performance of males was superior to that of females. This might be because males have greater strength, they are taller, or because they typically have greater experience in shooting basketballs than females. Also, the level of initial performance of males was higher than that of females. The mean intrinsic motivation of males was significantly higher than that of females. Given current gender roles, it is not surprising that males were more interested in the basketball task at the start. The mean perceived competence for males was higher than that for females. This is supported by the research of Granleese, Trew and Turner (1988) which indicated that boys had higher mean score for all the domains of a perceived competence scale for children developed by Harter (1982). The level of initial preceived competence in the males was higher than that of females in the present study.

To sum up, monetary reward was presented in an explicitly controlling manner in this study. The results were not all consistent with Deci's (1975) Cognitive Evaluation Theory. The findings of the present study might suggest that extrinsic reward is less controlling than previous research has proposed, at least when it is presented in a performance-contingent manner. In a highly interesting and challenging task, extrinsic reward did not detrimentally affect perceived competence and intrinsic motivation, infact, intrinsic motivation was increased or maintained throughout the activity as was perceived competence and also performance. Basketball free throw shooting may be both challenging and interesting to most, if not all students. Perhaps rewards did not act as expected in this study because monetary reward is so rarely given to school students. It may have been the excitement rather than the reward which affected performance, perceived competence and intrinsic motivation.

Although, the present study clearly showed that when extrinsic reward was given, performance, perceived competence and intrinsic motivation improved, one should be cautious to use monetary reward to improve skill and motivate students, because extrinsic reward might have detrimental effects on intrinsic motivation in some circumstances. One should not hesitate to give extrinsic reward to indicate recognition of ability on appropriate occasions and in an informational manner because it is very powerful in motivating and increasing performance. More study of extrinsic reward and intrinsic motivation in performance-based tasks in sport or other areas should be conducted to clarify whether Cognitive Evaluation Theory may need to be elaborated in the case of such activities. Results of the present study were not conclusive, but suggested that information directly from performance might have influenced perceived competence and hence intrinsic motivation.

It is interesting to note that although extrinsic reward significantly increased performance, perceived competence was not as strongly affected. It is possible that subjects may not have had enough time to ponder and evaluate their competence in such a relatively short period, and that their improvement in performance was more due to their desire to do their best than on perceived competence. The value of perceived competence appears relatively unstable because the level of perceived competence for the control group indicated slightly decrease from occasion 2 to 3 even performance improved slightly with learning effect, but the value of this group increased more than the level of initial perceived competence when reward was removed. The relationship could be examined by use of path analysis technique, and result might be more valuable to fully understand in the present study.

Further research in this area should utilize various forms of problem-solving task such as those involving both logical and physical skills and not rely so heavily on puzzle solving skills. In testing the effect of extrinsic reward on different forms of activity, a better picture will emerge of the relationship between extrinsic reward and behavior and its effect on perceived competence and intrinisic motivation. In addition, a tighter definition of reward needs to be considered which might lead to more consistent results, but with different implications for different types of reward. The present study suggests that comparison between task-contingent reward and performance-contingent reward might clarify the role of contingency. Most research ignores the importance of performance feedback, preferring to emphasise the effect of extrinsic reward. The importance of performance feedback should not be neglected because of its potential effect on perceived competence and intriniscmotivation. More studies should include in their design performance feedback. The present study did not manipulate performance feedback, but attempted to control for its effects by informing every subject of the number of baskets scored. The subjective interpretation of this information was not directly mentioned, however in the future, studies should measure or manipulate the level of performance feedback. Monetary reward is rarely given to increase motivation, rather it is intended to improve performance.

The performance-contingent reward, perceived as an indicator of the subject's achievement and improvement, can be increase performance, perceived competence and intrinsic motivation. It is unlikely that performance-contingent reward has a detrimental effect on subsequent motivation. In fact, in the short term, performance-contingent reward appear to be a powerful factor in increasing performance and intrinsic motivation. In the long-term, performance-contingency reward may still affect intrinsic motivation, as it may be interpreted as an acknowledgment of progress in performance. Moreover, it is a norm in today's sports culture to provide performance-contingent reward always to affirm superior performance and effort exerted. Added to this, as Deci and Ryan observed in 1985, the availability and easy access to any activity like sports can easily contribute to intrinsic motivation.

Teachers and coaches commonly give feedback, in the form of compliments, to motivate the learner. Therefore, the effect of feedback on performance, perceived competence and intrinsic motivation should be investigated alongside other extrinsic rewards, as it has been done by Anderson et al. (1976).

Particularly, it is necessary to examine the relationships between extrinsic rewards, performance, perceived competence and intrinsic motivation by using causal modelling techniques. The ANOVA analysis sought to determine if and when significant changes occurred in each of the variables, namely performance, perceived competence and intrinsic motivation. This analysis does not by itself explain why these change occurred or whether one change mediated another. Causal modelling analysis, on the other hand, can test Cognitive Evaluation Theory predictions and the performance-related hypotheses of this thesis. It shows whether changes to intrinsic motivation were caused by rewards directly, by changes in basketball performance, or through changes in perceived competence either directly or as a result of improved basketball performance. In view of the implication of these issues to understanding of the process by which extrinsic rewards, performance, perceived competence and intrinsic motivation are related, causal modelling analyses using, first, traditional regression techniques and then sophisticated structural equation modelling techniques were executed and are reported in the following chapter.

y

Chapter 5. Causal Modelling Monetary Reward, Performance, Perceived Competence And Intrinsic Motivation

5.1. Introduction

Analysis of variance does not test relationships among a set of variables and how they relate to one another, but examines the impact of independent variables on one dependent variable. In order to test for causal relationships it was, thus, determined to examine the relationship between extrinsic reward, performance, perceived competence and intrinsic motivation through path analysis. Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985) makes predictions that a perceived change from internal causality to external causality, that is a reduction in self-determination, results in extrinsic reward decreasing intrinsic motivation. Also changes in perceived competence and self determination through information from an extrinsic reward lead to a change of intrinsic motivation, in the same direction as the shift in perceived competence or self determination. Vallerand and Reid (1984) tested the relationship between extrinsic reward, in the form of feedback, perceived competence and intrinsic motivation by using path analysis. Their results showed that intrinsic motivation is more affected by the change in perceived competence resulting from positive feedback than by positive feedback directly influencing intrinsic motivation.

Instead of using feedback, however, this study focused on the relationship between a monetary extrinsic reward, performance, perceived competence and intrinsic motivation. A very important factor in sport is performance, and good performance often motivates people to participate further in the activity. As such, people who are concerned about performance, might encourage the performer to greater achievement by using various motivational techniques such as extrinsic reward and goal setting. It is expected that when performers achieve a higher level of performance through extrinsic reward, they feel a sense of competence due to recognition of their ability to do the task. Therefore, it is argued that extrinsic reward can change perceived competence indirectly through enhanced performance, as well as directly through perceived competence and intrinsic motivation. The change in perceived competence would then influence intrinsic motivation. Thus, this study developed a recursive causal model to investigate the relationship between extrinsic reward, performance, perceived competence and intrinsic motivation over three performance occasions, using path analysis.

5.2. Path Analysis Using Multiple Regression Techniques

5.2.1. Introduction to Method of Analysis

Following the approach used by Vallerand and Reid (1983), multiple regression analysis was employed to generate the path coefficient statistics which form the basis of this causal modelling technique.

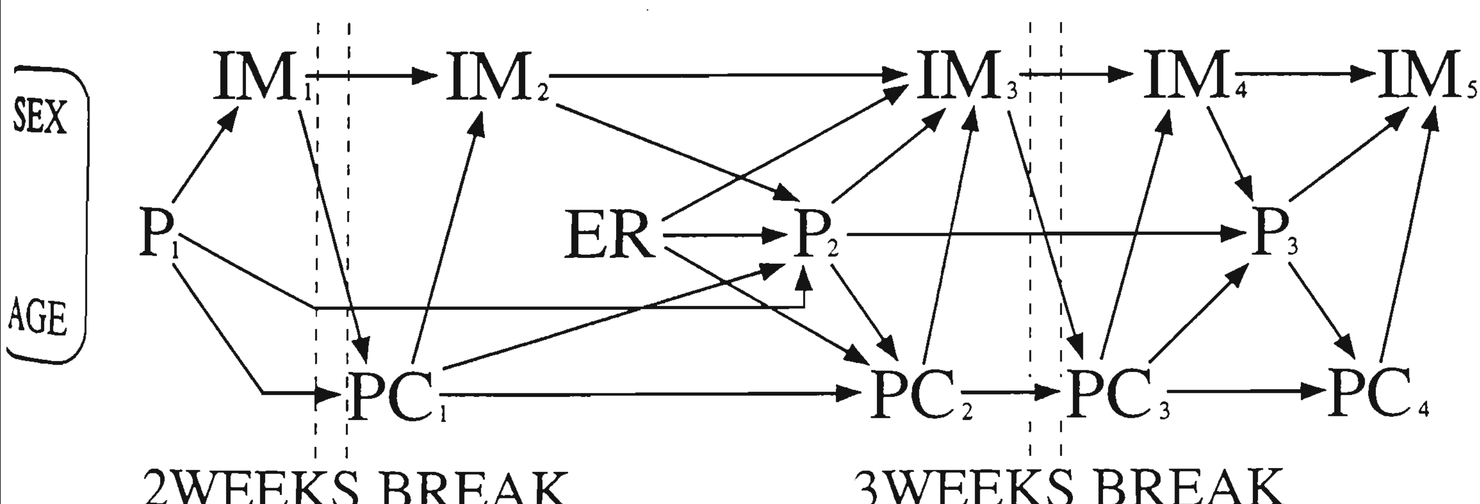


Figure 5.1 Causal model relationship between extrinsic reward, performance, perceived competence and intrinsic motivation with age and gender in the overall model.

To represent and examine the whole of the model presented in Figure 5.1, 12 regression models were calculated using the SAS General Linear Model Program. This statistical package tested for significance of the paths, using t-tests to examine the regression coefficients.

The 12 regression models are presented in Table 5.1, which indicates which predictor variables were regressed on each outcome variable.

Table 5.1.

Multiple Regression Equations to Test Paths in the Causal Model relating Extrinsic Reward, Perecived Competence and Intrinsic Motivation.

Predictor Variables	Outcome Variable
Age and Sex	Performance (p1) Occasion 1
Age, Sex and Performance (p1)	Intrinsic Motivation (im1) Occasion 1
Age, Sex and Performance (p1)	Perceived Competence (pc1) Occasion 2, before performance (p2)
Age, Sex , Performance (p1) and Intrinsic Motivation (im1)	Intrinsic Motivation (im2) , Occasion (2) before performance (p2)
Age, Sex , Performance (p1) and Extrinsic Rewards	Performance (p2) Occasion 2.
Age, Sex, Perceived Competence (pc1) before Occasion two, Extrinsic Reward and Performance (p2) Occasion 2	Perceived Competence (pc2) , Occasion 2, After Performance (p2)
Age, Sex, Performance (p2) Occasion 2, Extrinsic Reward, Perceived Competence (pc2) after Occasion 2, Intrinsic Motivation before Performance (p2) on Occasion 2	Intrinsic Motivation (im3) after Performance (p2) Occasion 2
Age, Sex , Performance (p1), Extrinsic Reward, Performance (p2)	Performance (p3) Occasion 3
Age, Sex, Extrinsic Reward, Performance (p2), Perceived Competence (pc2) Intrinsic Motivation (im3)	Perceived Competence (pc3) before Occasion 3
Age, Sex, Extrinsic Reward, Performance(p2), Intrinsic Motivation (im3) and Perceived Competence (pc3)	Intrinsic Motivation (im4) before Performance (p3) Occasion 3
Age, Sex, Extrinsic Reward, Intrinsic motivation (im4)and Perceived Competence (pc3), Performance (p3)	Perceived Competence (pc4) after Performance (p3) Occasion 3
Age, Sex, Performance (p3,) Perceived Competence (pc3,) and Performance (p3)	Intrinsic Motivation (im5) after Occasion 3

5.2.2. Results of Path Analysis

The standardised regression coefficient (beta coefficient) acted as the path coefficient for each causal path in each part of the overall causal model. For age, sex and extrinsic reward dummy coding procedures were used, as in Vallerand and Reid (1984), who followed Kerlinger and Pedhazur (1973). For gender, males were coded as 1 and females were coded as 2. For age, Year 7 students were coded as 1 and Year 10 students were coded as 2. Finally, for reward, the Control Group was coded 1 and the Experimental Group was coded as 2. To examine the significance of the predicted paths into any variable in the model, the variables representing these paths were tested for significance using the 12 regression models. Significant path coefficients are presented in the version of the full model in Fig 5.2. The full analysis results consisting of all path coefficients are presented in Appendix (17).

The results of the path analysis indicated that certain paths were significant ($p<0.05$) within the causal model. Performance score (p1) in the pretest significantly predicted performance (p2) in the treatment period. Performance score (p3) in the delayed post test, that is, when reward was removed, was significantly influenced by performance score (p2) in the previous treatment period. The present data thus, indicate that previous performance had a strong impact on following performance level.

For perceived competence, the level of perceived competence (pc1) before performance on Occasion 2 (p2) had a significant direct effect on perceived competence score after performance on Occasion 2 (pc2) which was also influenced by extrinsic reward. The level of perceived competence after performance on Occasion 2 (pc2) through extrinsic reward, has a significant effect on the level of perceived competence (pc3), three weeks after the treatment period, and before performance in the delayed post test. Also the level of perceived competence (pc4) measured immediately after performance on the third occasion was significantly influenced by previous perceived competence (pc3) before that performance. Again, it can be concluded that previous level of perceived competence exerted a strong influence on following perceived competence level all through the study.

Following the same pattern, each of the four measures of intrinsic motivation over all succeeding occasions (im2, im3, im4 and im5) was significantly predicted by the previously measured level of intrinsic motivation, commencing with intrinsic motivation after performance on Occasion 1 (im1). This, once more reflected the strong influence of immediately previous level of intrinsic motivation on its level on the next occasion of testing.

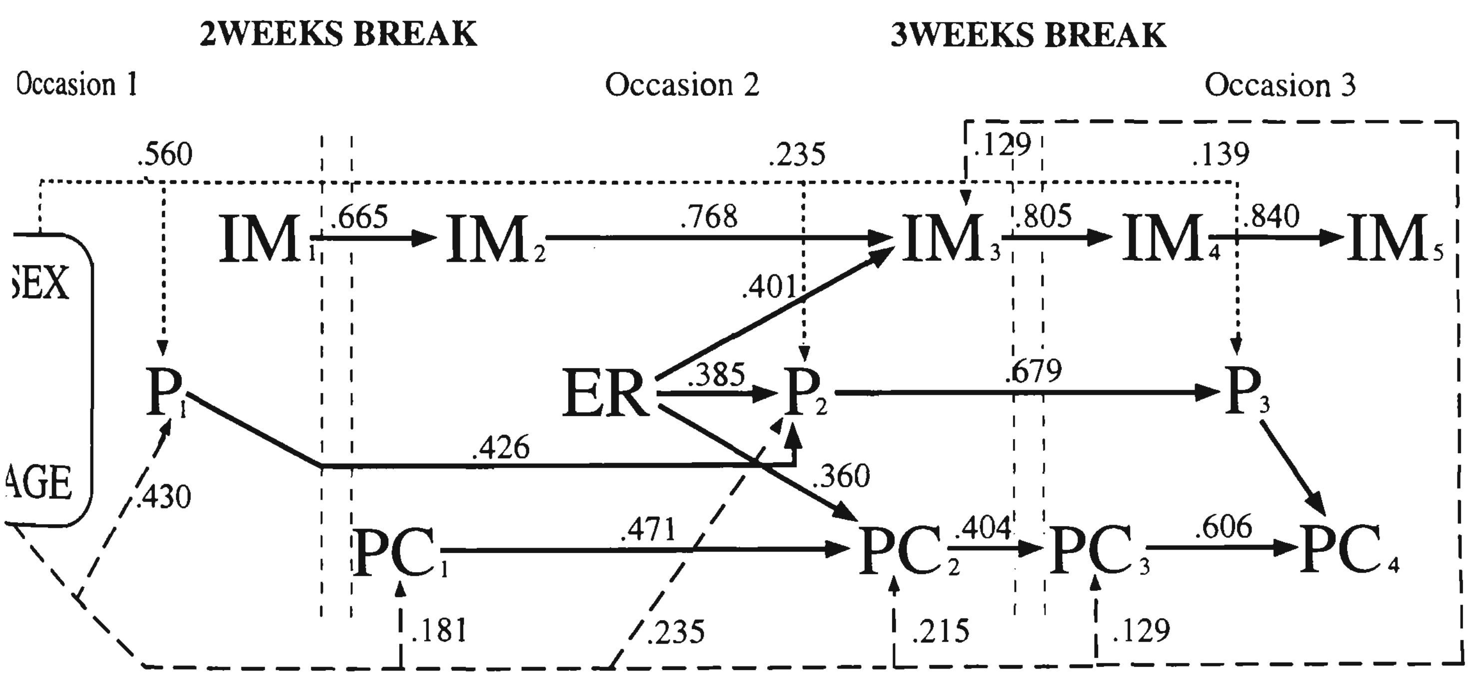


Figure 5.2 The result of causal relationships between extrinsic reward, performance, perceived competence and intrinsic motivation with age and gender in the overall model.

Regression coefficients for the background variables are shown in Appendix 17 . Using path analysis a number of the variables were seen to be significantly ($p<0.05$) influenced by age and gender. There were several significant effects for age.

The level of performance (p1) in the pretest period was directly affected by age. However, the younger students' performance improved more in relation to their performance when the reward was offered, suggesting the younger students were more influenced by the reward.

The level of perceived competence (pc1) just before performance on Occasion 2 (p2) was significantly predicted by the age variable. The level of perceived competence after performance on Occasion 2 (pc2), and the level of perceived competence (pc3) before performance (p3) on Occasion 3, were significantly affected by age. For these three occasions, higher perceived competence was obtained for the younger age group. The level of intrinsic motivation (im3), when reward was provided, was significantly affected by age.

Also, three significant effects for gender were found in the causal model ($p<0.05$). The level of performance (p1) in the pretest, performance on Occasion 2 (p2) and performance on Occasion 3 (p3) were significantly affected by gender. For basketball performance, the males had significantly higher performance scores than females. These results are in agreement with the ANOVA results.

Three paths were produced from the extrinsic reward variable which had significant path coefficients ($p<0.05$). The first was to performance on Occasion 2 (p2) which was measured immediately after extrinsic reward being given during the treatment period. The second was to the level of perceived competence on Occasion 2 (pc3) measured immediately after performance on Occasion 2 (p2) and the third was to intrinsic motivation measured immediately after performance (p2) in the treatment period (im3). The relationships between the level of performance (p2) and both intrinsic motivation (im3) and perceived competence (pc1) were not significant. Also, the relationship between perceived competence (pc2) and intrinsic motivation (im3) was not significant ($p>0.05$).

5.2.3. Discussion of Path Analysis

The results of the path analysis in this study examining a causal model based on the theoretical formulation of Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985), the proposed role of performance, the longer term effect of extrinsic rewards, and the effect of their removal, indicated that the previous level of performance, perceived competence and intrinsic motivation were strong predictors of each following value of the same variable.

A noticeable result of this study was that after two weeks break between pretesting (Occasion 1) and the reward period (Occasion 2), and three weeks break between the reward period (Occasion 2) and no reward period (Occasion 3) the previous level of performance, perceived competence and intrinsic motivation had a significant causal link to the same variable that followed the break. It is possible that some subjects might have played basketball in clubs or at leisure centres during this period or might have done free throw shooting as part of a physical education class or casually at home. Basketball is rapidly gaining in popularity as a leisure time activity in Australia. While these activities all present potential for extraneous experiences which could alter performance, perceived competence and intrinisic motivation, the causal paths indicate that there was no significant change in the three variables over the breaks between Occasion 1 and 2 and Occasion 2 and 3.

It is difficult to explain why performance had no significant effect on either perceived competence or intrinsic motivation when reward was given. There was certainly a notable increase in performance for most rewarded subjects. It might be expected that this would influence perceived competence. The result found here is in contrast to the previous finding of Vallerand and Blais (1986) that the participants' subjective evaluation of positive performance in a basketball game had a strong effect on the sense of perceived competence, which in turn resulted in increased intrinsic motivation. However, extrinsic reward had a significant effect on performance, perceived competence and intrinsic motivation, respectively all in a positive direction, which is supported by the ANOVA results discussed in Chapter 4. In this case it is possible that the feedback provided by extrinsic reward might have encouraged subjects to perceive their competence to be enhanced. Also, it can be argued that intrinsic feedback from continuous learning helped in the progress of skill and indirectly encouraged subjects to feel more competent. The above situation, though temporary, enabled subjects to perform better due to personal interest and enhanced effort which in turn influenced intrinsic motivation. In summary, it is likely that the monetary reward was more salient as a source of information to increase perceived competence than was actual performance itself. Vallerand and Blais (1986) did not have a monetary reward as an extrinsic reward.

Significant causal paths between performance on Occasion 2 and 3, combined with the ANOVA finding, indicated that performance retained its higher level of over a three week break. Similarly, causal paths between perceived competence on those two occasion and between intrinsic motivation, considered with the ANOVA results, indicated that these variables remained at their increased level over the longer term. Simillar, patterns between Occasion 3 before performance and after performance, indicated that there was no detrimental effect on perceived competence or intrinsic motivation of removing the monetary reward for performance on Occasion 3.

In the absence of reward on Occasion 3, performance influenced neither perceived competence (pc4) nor intrinsic motivation (im5) according to the causal modelling analysis. It appeared that the level of improved performance between Occasion 2 and Occasion 3 was not sufficient to influence perceived competence and intrinsic motivation in the absence of the monetary reward. It is here, where no reward was offered or given, that the influence of performance might likely have been expected, as in Vallerand and Blais (1986).

The causal modelling analysis of the present study did not find the mediating effect of perceived competence on intrinsic motivation. This is not consistent with the finding of previous studies that the effect of perceived competence mediates the change in intrinsic motivation (Vallerand & Reid, 1984, 1988; Whitehead & Corbin, 1991). This might reflect a difference between the impact of monetary reward and that of verbal feedback. Also, analysis for the present study included a pretest, a test of the longer term effect and a test of the removal of reward. The previous studies (Vallerand & Reid 1984; Whitehead & Corbin, 1991) examined only the effect of perceived competence on intrinsic motivation on the single occasion when verbal feedback was offered or provided. In the present studies, previous intrinsic motivation had a strong causal effect on the next measure of intrinsic motivation, which may have saturated the effect of perceived competence on intrinsic motivation. It might be argued that the abscence of a strong relationship between perceived competence and intrinsic motivation is surprising as the intrinsic motivation questionnaire (IMI) included a three-item perceived competence subscale. Any small effect could be attributed to this, suggesting that perceived competence actually had very little influence on intrinsic motivation.

The effect of age on perceived competence on each occasion was significant in the causal model. From the ANOVA analysis, it was found that perceived competence for the younger (Year 7) group was significantly higher than for the older (Year 10) group. This lends support to Nicholls (1984) suggestion that subjects up to 13 years of age feel that performance depends on effort, whereas the perception of subjects over 13 years old is that performance depends on ability. It is likely that the younger students had less experience than the older students. The younger students may not have perceived that their ability was limited. They may have attributed their performance to the effort they made, that is, they might have thought that their effort would improve their performance. On Occasion 1 and 2 particularly, performance for year 7 did improvement a lot, so it was inferred by them that improved performance based on effort did mean they were more competent. Older subjects attribute performance more to ability and this leads them to be more aware of the limits of their perceived competence. At the same time, perhaps because they were not novices at the start, their performance did not improve as much as that of year 7 students. Gender also had a significant effect on performance for all occasions. This might have been because male students had more interest and experience in this task and had more physical height and strength than the females.

In summary, the causal modelling analysis supported the ANOVA results of the present study, suggesting that the extrinsic reward significantly and directly influenced performance, perceived competence and intrinsic motivation in a positive direction. This might have been, at least partly, because of the performance-contingent format of administration of the reward. The performance-contingent reward appeared to influence positively each variable because subjects perceived that the reward was a sign of competence and improved performance. Thus, subjects gave more emphasis to the informational value of the reward than to the controlling presentation of the reward itself.

In interpreting the results of the ANOVA analysis and that of path analysis it is important to emphasize the differences between the objectives of the two modes of analysis. In ANOVA changes in the means of the variables are examined, while in path analysis the path coefficients correspond to correlation co-efficients between the standardised variables. Although the ANOVA analysis gives information about the changes in the variables following the introduction of the experimental treatments, the path analysis focusses much more closely on the reasons for the changes. It allows the question of whether an observed change in a measured variable is a direct one, or whether it is mediated by a change in another observed variable. The path analysis is thus trying to address the scientific questions of interest much more directly than the ANOVA analysis. One important finding from the multiple regression modelling analysis was that perceived competence was not found to be a mediating variable between reward and intrinsic motivation at any stage of the present study.

Path analysis is a subset of a class of modelling procedures called Linear Structural Regression Modelling. These models are commonly implemented using the LISREL Package (LISREL 7), although other computer packages are available such as EQS. The objective of using the LISREL paradigm is much the same as when a path analysis is performed and in many cases the models obtained are identical. In addition, more comprehensive methods for assessing the model fit are provided in the LISREL framework. It is thus the case that LISREL gives the theorist the opportunity to specify, examine, and compare for fit a range of models, making it potentially more powerful than merely using path analysis. In order to test the goodness of fit of the data to the model, a LISREL structural equation modelling analysis was also executed.

5.3. LISREL Structural Equation Modelling Analysis of the Effect of Monetary Reward on Performance, Perceived Competence and Intrinsic Motivation

5.3.1. Introduction

Path analysis techniques, using multiple regression were popular in the 1980s. They do not include any testing of the fit of the data to the model beyond the strength of specific paths. Also, path analysis does not take into account correlations between errors in equations, and it is difficult to determine if the model is a good or bad fit. Recently developed and popularised, linear structural equation modelling provides a more detailed technique to examine models, including a number of estimates of goodness of fit against all variables. Structural equation modelling examines the correlation between errors in all the variables. On the basis of expert advice (Schutz, personal communication, July 1, 1993), it was decided to use structural equation modelling to confirm and extend the path analysis executed using multiple regression analyses and to assess the goodness of fit of the data to the proposed model.

5.3.2. Structure of the Model

This study was structured across three testing sessions for all subjects. The causal model thus consists of three occasions. First, subjects were selected who showed moderate intrinsic motivation for the basketball free throw shooting. Second, two weeks after that pretest, subjects were tested again and half of them from each cell, predetermined randomly, were offered and received the extrinsic reward, while the remaining subjects received no reward. Third, three weeks later the same procedure was followed as in the intermediate test, except that no extrinsic reward was offered or given to either group. The rationale for the construction of the causal model is now described. Elements are added to the model progressively to clearly illustrate the way it was constructed. The arrows reflecting new paths of interest are highlighted in bold on the corresponding figures. Some of the codes referring to variables in the model may appear odd in the paths of the model as it builds up. They were numbered sequentially in the full model for overall consistency. This step-by-step process of building the full model is now described.

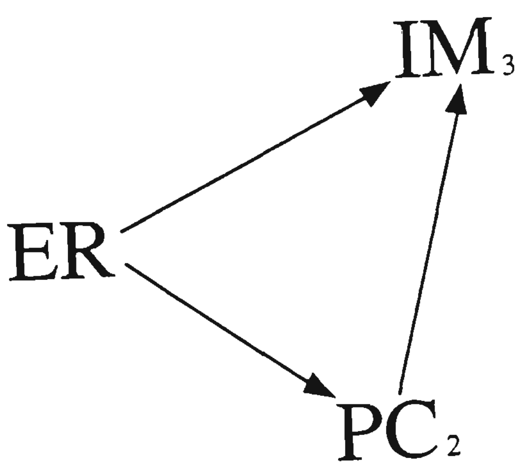


Figure 5.3 Causal model linking extrinsic reward, perceived competence (pc2) and intrinsic motivation (im3) on occasion 2.

5.3.2.1. Basic extrinsic reward, - perceived competence and intrinsic motivation model.

Fig 5.3 shows the causal model derived from the model of Vallerand & Reid (1984) and based on Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980). This indicates that extrinsic reward is predicted to have a direct effect on intrinsic motivation (im3) and an indirect effect on intrinsic motivation, mediated through perceived competence (pc2), based on Cognitive Evaluation Theory.

5.3.2.2. Model including performance.

Fig 5.4 depicts the model including performance. This reflects a central theme of this thesis; the mediating role of performance in the extrinsic reward and intrinsic motivation relationship. The bold arrow paths indicate that it was predicted that extrinsic reward (er) directly influences performance (p2). Any observed change in performance then influences perceived competence (pc 2), which affects intrinsic motivation (im3). These causal paths are added to the traditional extrinsic reward perceived competence, intrinisic motivation links.

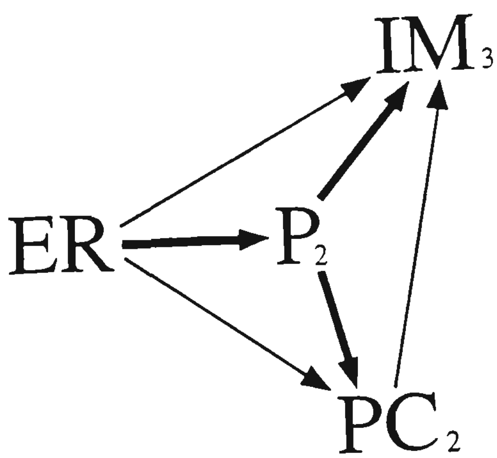


Figure 5.4 Causal model including paths to and from performance (p2) on occasion 2.

5.3.2.3. Effect of two week delay from pre-test to treatment occasion.

Figure 5.5 presents predicted causal paths in the causal model including the two week break between the pretest on Occasion 1 and the Occasion 2, but prior to, the extrinsic reward being offered. Any change noted in intrinsic motivation after the treatment could be caused by factors operating during the two weeks break between pretest and treatment. Intrinsic motivation (im2) was, thus, also measured on the treatment occasion (Occ2) before treatment to test for any extraneous changes in intrinisic motivation during the two week delay. In order to examine changes in perceived competence as a consequence of the treatment, it was also necessary to measure perceived competence prior to treatment (pc1). Because Cognitive Evaluation Theory proposes that perceived competence influences intrinsic motivation, perceived competence was measured first, followed by intrinsic motivation and then the treatment condition was presented.

These links, namely, intrinsic motivation on Occasion 1 (im1) to intrinsic motivation on Occasion 2 (im2), performance on Occasion 1 (p1) to perceived competence before performance on Occasion 2 (pc1), perceived competence before performance on Occasion 2 (pc1) to perceived competence after performance 2 (pc2), and intrinsic motivation before performance on Occasion 2 (im2) to intrinsic motivation after performance on Occasion 2 (im3) are depicted in Figure 5.5 in bold.

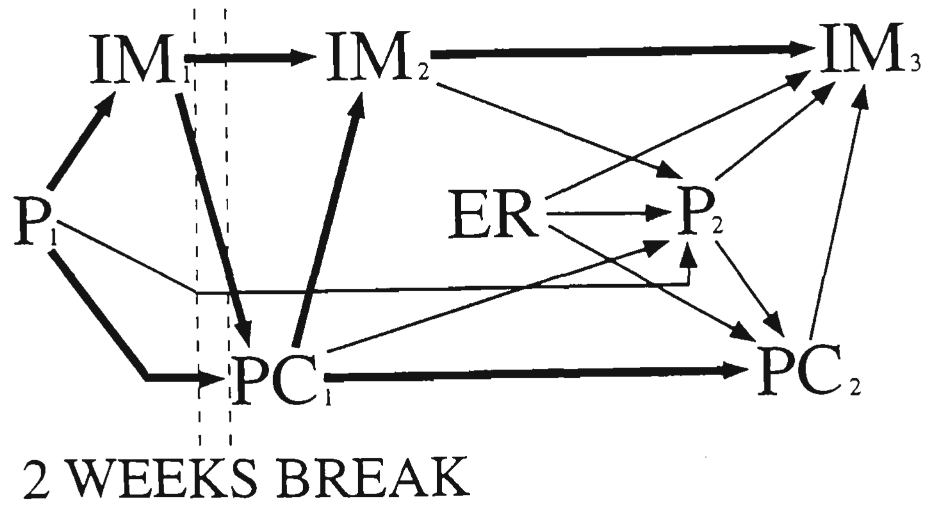


Figure 5.5 Causal model on occasion 2 including two weeks breaks after pretest.

5.3.2.4. Effect of three week delay after reward.

Three weeks after the reward was removed, subjects were retested with no reward, to examine the effect of withdrawing the reward. Before performance, perceived competence (pc3) and intrinsic motivation (im4) were measured again, respective in that order. This permitted examination of the effect of the three week delay on perceived competence and intrinsic motivation as shown in Figure 5.6. by the bold causal path arrows, as well as cross-over effects of intrinsic motivation (im3) on perceived competence (pc3) and perceived competence (pc2) on intrinsic motivation (im4). Present research defined the longer term effect of reward as the time, after three week break with reward being provided on Occasion 2 to the measurement of perceived competence and intrinsic motivation before performing when reward was removed on Occasion 3.

5.3.2.5 Effects of removal of reward.

To examine the effect of removing the extrinsic reward, subjects finally performed for a third time (p3). The effect of removal of reward is defined as the measure of perceived competence and intrinsic motivation after performance when reward was removed. Then perceived competence (pc4) and intrinsic motivation (im5) were measured again.

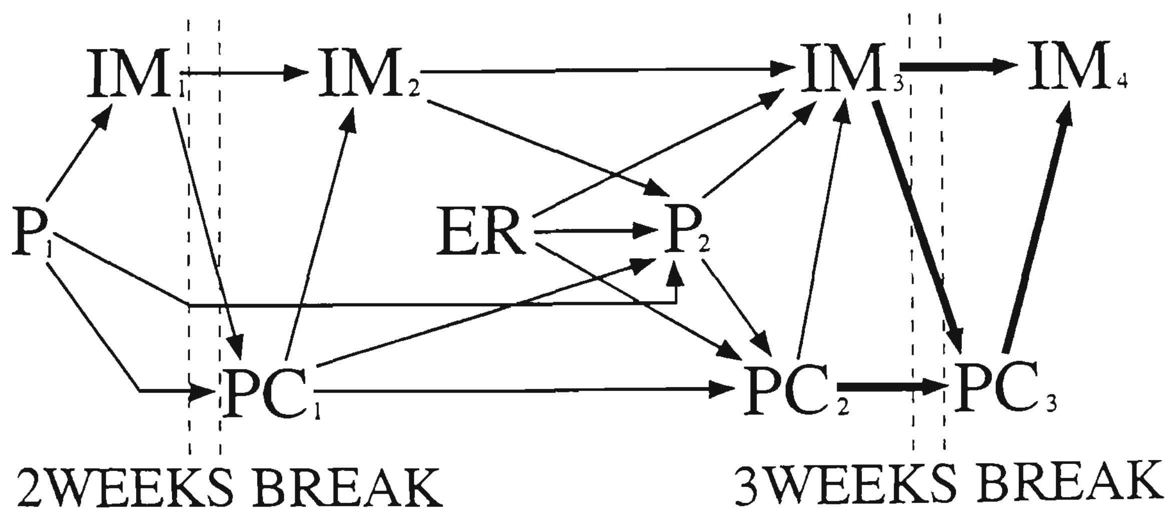


Figure 5.6 Causal model before performance (p3) in the absence of reward including 3 weeks break after occasion 2, and 2 weeks break after pretest.

No reward was offered or given, so this constituted removal of reward for the experimental group. The relationships between performance, perceived competence and intrinisic motivation in these circumstances were examined. The causal paths of interest are illustrated in bold in Fig 5.7.

5.3.2.6 Age and gender effects.

Age and sex were included as background variables in this causal model, so they are also shown in bold in Fig 5.8. This Figure, thus, presents the whole model proposed

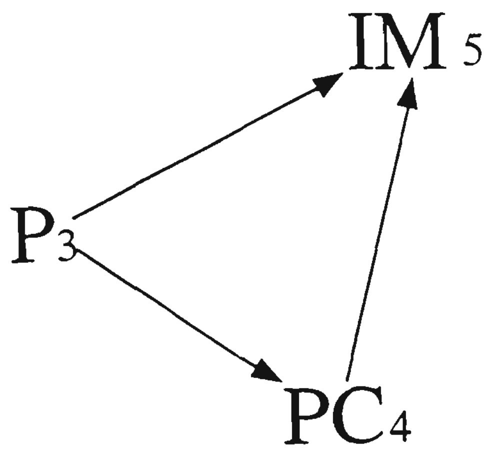


Figure 5.7 Causal model of the effect of performance (p3), in the absence of reward on perceived competence (pc4) and instrinsic motivation (im5).

and tested in this study. This structure of the model was the same as that presented in section 5.2 in figure 5.1.

The greater sophistication of LISREL's structural equation modelling approach also allows for parts of the model to be examined separately. In the following analysis, each stage of the model which reflects an issue being examined was analysed separately, then the overall model was tested. Thus, the effects to be tested are described in the step-by-step construction of the overall model in sections 5.3.2.1. to 5.3.2.6.

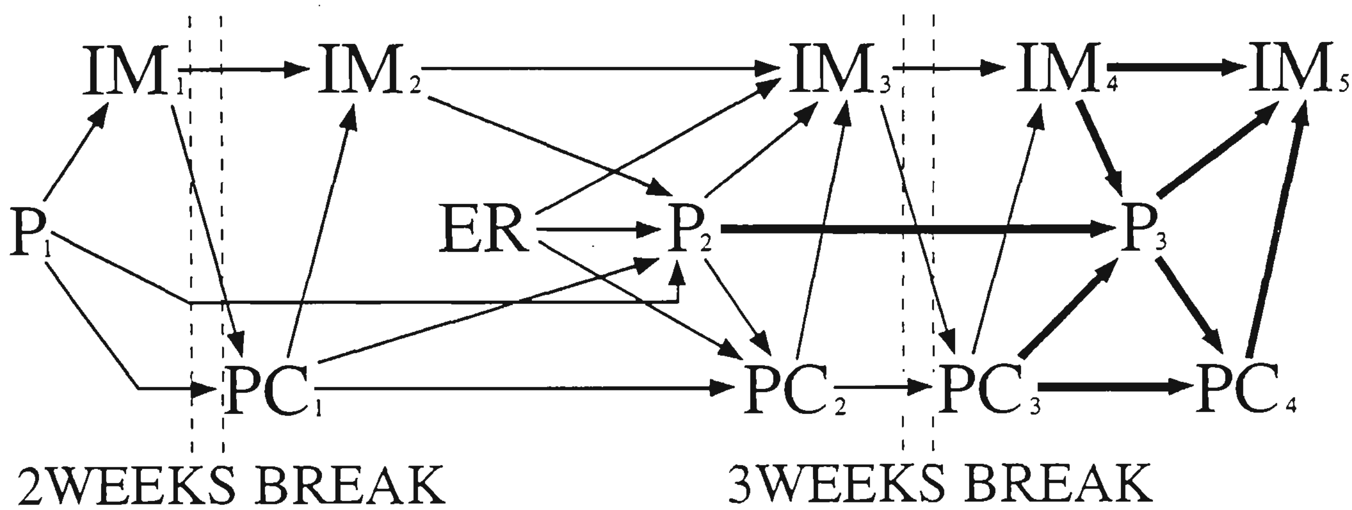


Figure 5.8 Causal model relationship between extrinsic reward, performance, perceived competence and intrinsic motivation with age and gender in the overall model.

5.3.3. Analysis

The LISREL 7 package (Joreskog & Sorbom, 1989) gives a very convenient and powerful method of performing a path analysis and testing for goodness of fit. Any model leads to a prediction of the variances and covariances between the observed parameters such as the path co-efficient between each pair of variables. The parameters are estimated by choosing those values which minimise the discrepancy between the observed variance and covariance and those predicted by the model. The package gives various measures of the fit of the model which assist in determining whether the model should be modified. Similarly, for each parameter that has been estimated, a t-value can be calculated so that it can be decided whether that parameter should be dropped from the model on the basis of statistical significance. In all analysis where it was involved, the treatment was dummy coded 1 for the rewarded group and 2 for the control group. This means that path coefficients indicating that the rewarded group was superior are negatively signed. All t-values in the text given by the LISREL program are actually z-scores and are approximately normally distributed. Path-coefficients with values of t larger in magnitude than 1.96 are significantly different from 0 at the 5% level.

5.3.4. Results

Tests of parts of the model, the full model and goodness of fit are discussed in this section. Where relevant comparisions are made to the multiple regression analysis in section 5.2. The effect of extrinsic reward on perceived competence and intrinsic motivation, as shown by the LISREL structural equation model in Figure 5.9, indicated that extrinsic reward significantly and directly influenced both perceived competence (pc2) (path coefficient = .305, t=4.1) and intrinsic motivation (im3) (path coefficient = .375, t=4.808). Perceived competence also significantly influenced intrinsic motivation (path=.176, t=2.148).

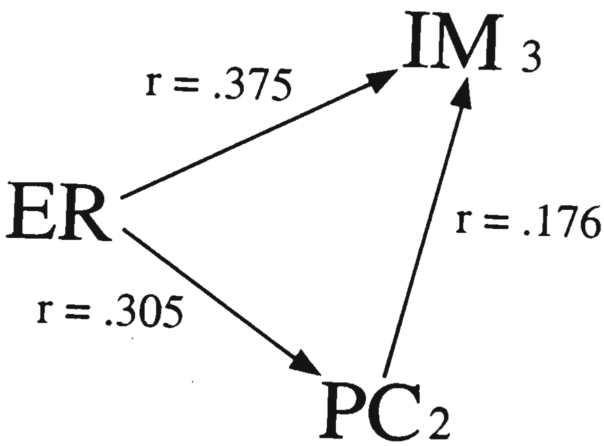


Figure 5.9 The result of causal model linking extrinsic reward, perceived competence (pc2) and intrinsic M motivation (im3) on occasion 2.

Figure 5.10 presents results for the path model incorporating performance. Results revealed that extrinsic reward significantly influenced basketball performance (p2) (path coefficient =.386, t=-6.111), perceived competence (pc2) (path coefficient .285, t=3.416) and intrinsic motivation (im3) (path coefficient =.366, t=-4.111). However, the influence of basketball performance (p2) on perceived competence (pc2) and intrinsic motivation (im3) did not attain significance (p=0.05), but the influence of perceived competence (pc2) on intrinsic motivation (im3) remained just significant (path coefficient=.175, t=2.135).

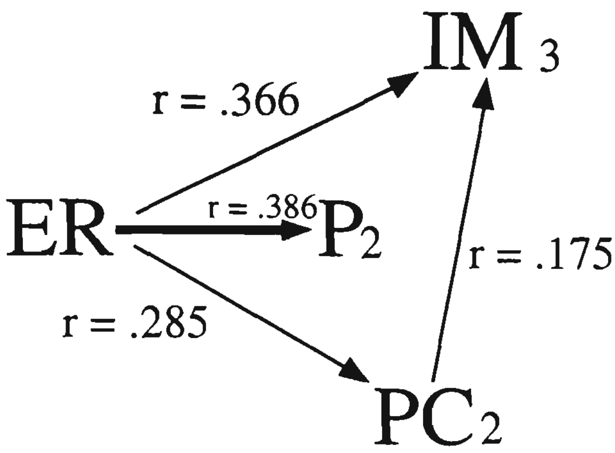


Figure 5.10 The result of causal model including paths to and from performance (p2) on occasion 2.

Fig 5.11 presents the results of the combined path model showing Occasion 1, a cessation of two weeks and Occasion 2. Intrinsic motivation (im 1) immediately after performance on Occasion 1 (p1) had a significant effect on intrinsic motivation (path=.665, t=10.500) two weeks later (im2), which in turn had a significant effect on intrinsic motivation (path=.768, t=17.815) after performance with extrinsic reward (er) (im3). Similarly, perceived competence (pc1) before performance and reward on Occasion 2 had a significant effect (path=.471, t=7.081) on perceived competence (pc2) after performance (p2) and the consequent extrinsic reward. Also, basketball performance (p1) on pretest had a significant effect (path=.426, t=5.452) on basketball performance (p2) after reward was offered. The effect of extrinsic reward did significantly influence performance (path=-.385, t=6.764) (p2), and perceived competence (path=.360, t=4.999) (pc2) and intrinsic motivation (path=-.402, t=8.201) (im3) that followed it. Performance did not have a significant effect on perceived competence (pc2) or intrinsic motivation (im3). With the addition of performance (p1), intrinsic motivation (im1), perceived competence (pc1) and intrinsic motivation (im2), the causal path from perceived competence (pc2) after reward to intrinsic motivation (im3) no longer proved significant.

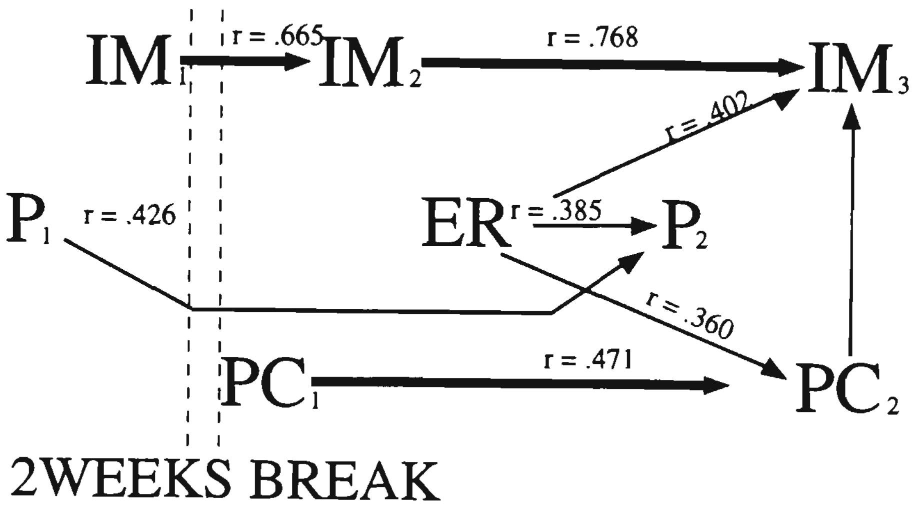


Figure 5.11 The result of causal model on occasion 2 including two weeks break after pretest.

Figure 5.12, which models the results of the effect of extrinsic reward, after a three week break, including perceived competence (pc3) and intrinsic motivation (im4) just before performance in the absence of reward on Occasion 3, indicated that intrinsic motivation (im3) and perceived competence (pc2) on Occasion 2 had a highly significant influence on intrinsic motivation (im4) (path=.845, t=11.868) and perceived competence (pc3) (path=.462, t=6.298), respectively, on Occasion 3. In this model, extrinsic reward had a significant effect on performance (p2) (path=-.386, t=6.74), perceived competence (pc2) (path=-.360, t=4.998) and intrinsic motivation (im3) (path=-.420, t=8.201) on Occasion 2. However, performance (p2) had no effect on either perceived competence (pc2) or intrinsic motivation (im3) as was also the case in Fig 5.4. Nor did perceived competence (pc2) on Occasion 2, after reward, significantly influence following intrinsic motivation (im3).

Importantly, these results indicate that the positive effects of extrinsic reward on perceived competence and intrinsic motivation on Occasion 2 were retained after the three weeks break with no experimental intervention.

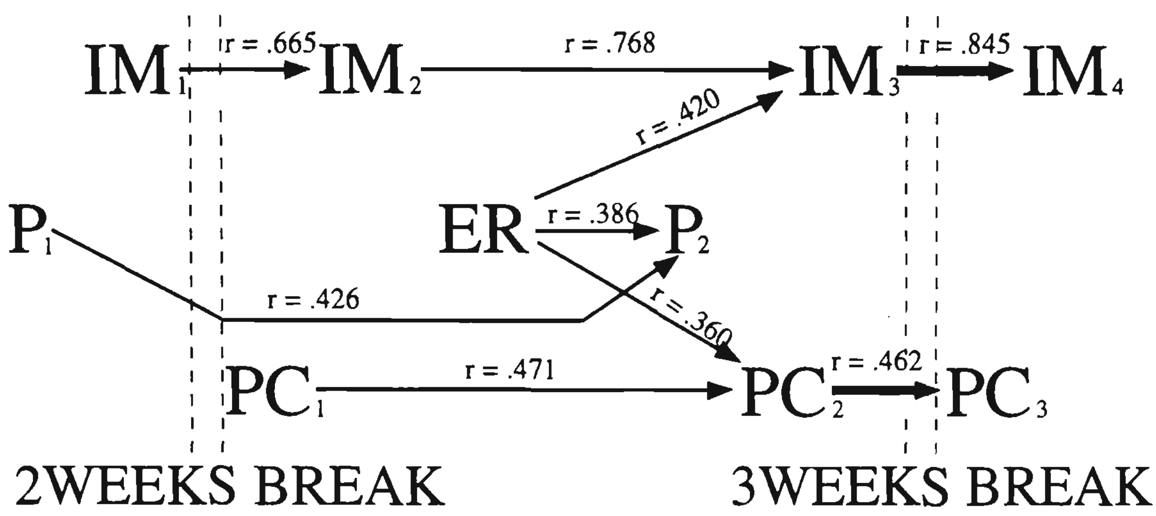


Figure 5.12 The result of causal model before performance (p3) in the absence of reward including three weeks break after occasion 2.

Figure 5.13 presents results of the model for the effect of withdrawal of the extrinsic reward after a three week break on performance (p3), perceived competence (pc4) and intrinsic motivation (im5). Results revealed that basketball performance (p3) significantly influenced perceived competence (pc4) (path =.198, t=2.329) and intrinsic motivation (im5) (path=.339 and t=3.614) on this occasion. However, the effect of perceived competence (pc4) on intrinsic motivation (im5) was not significant (p=0.05).

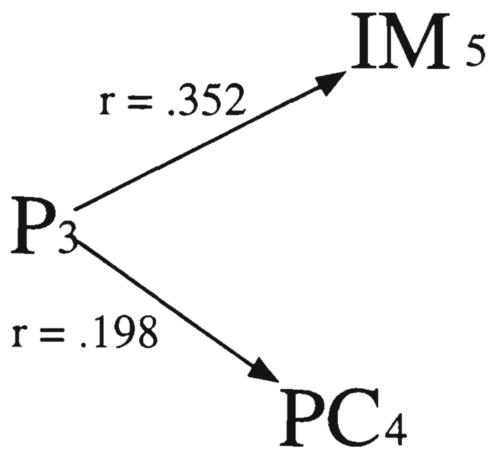


Figure 5.13 The result of causal model of the effect of the effect of performance (p3) on perceived competence (pc4) and intrinsic motivation (im5) following removal of reward.

Fig 5.14 presents the results of the overall path model. For paths not previously shown, intrinsic motivation (im4) before performance on Occasion 3 had a significant influence on intrinsic motivation after performance on Occasion 3 (im5) (path=.830, t=17.968). Performance on Occasion 2 (p2) and perceived competence before performance on Occasion 3 (pc3) had significant effects on performance (p3) (path=.721, t=14.098) and perceived competence (pc4) (path=.612, t=9.317) respectively, after performance on Occasion 3.

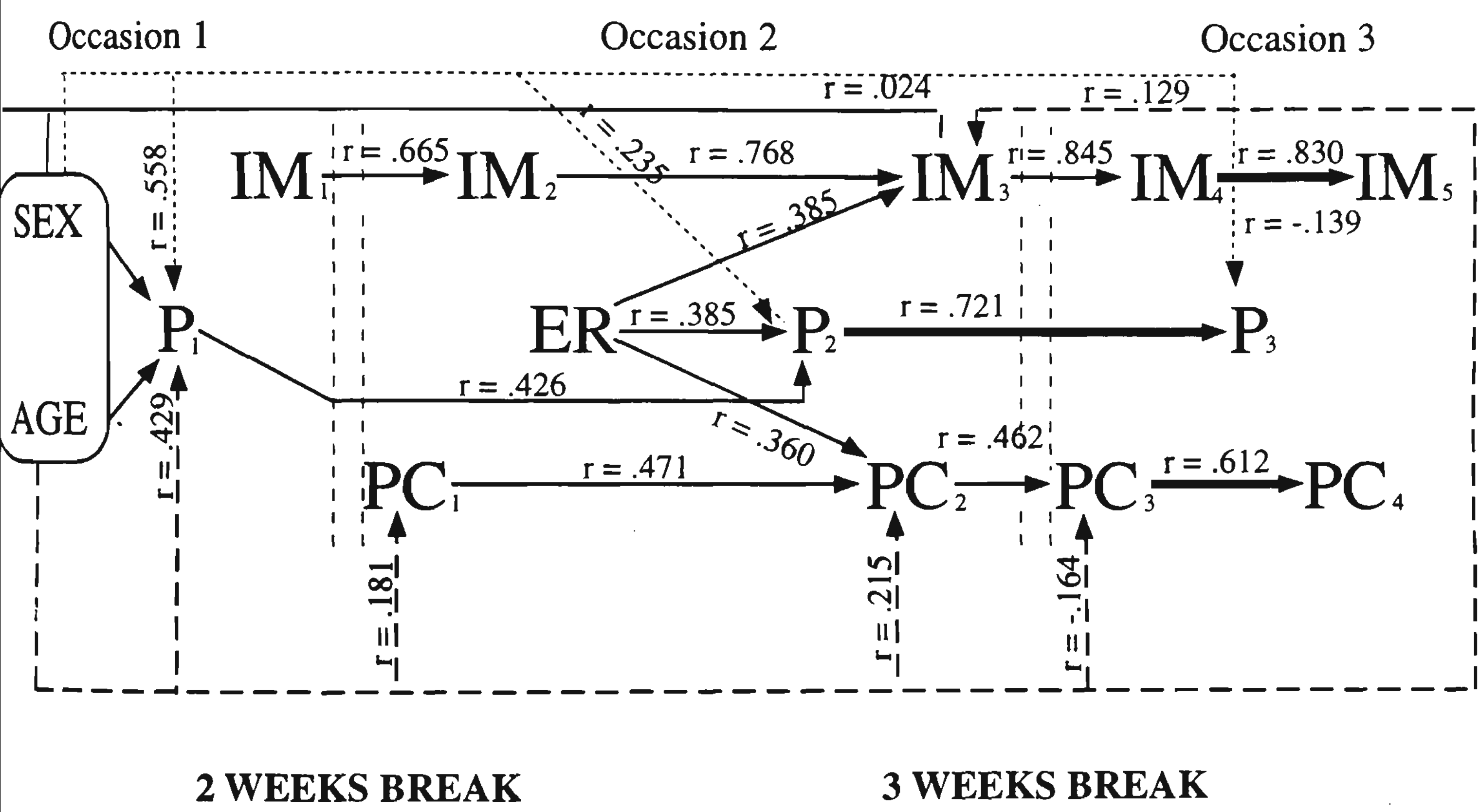


Figure 5.14 The result of causal model of predicted relationships of age and gender and extrinsic reward, performance, perceived competence and instrinsic motivation over three performance occasions in the overall model.

There was an age and gender effect on some dependent variables. Gender significantly influenced performance on Occasion 1 (p1) (path=.558, t=9.062), performance on Occasion 2 (p2) (path=.235, t=3.233) and performance on Occasion 3 (p3) (path=-.139, t=2.808), which suggested that the performance of males was higher than that of females. Age significantly influenced performance on Occasion 1 (p1) (path=.429, t=6.91). This is consistent with the expected ANOVA finding that older students performed better. Age also had a significant effect on perceived competence on Occasion 1 (pc1) (path=-.181, t=2.032), perceived competence on Occasion 2 (pc2) (path=.215, t=3.105) and perceived competence (path=-.164, t=2.210) on Occasion 3 (pc3). This reflects the ANOVA result that younger students reported higher perceived competence. Lastly, a significant age effect was found on intrinsic motivation (im3) (path=.129, t=2.827) only on Occasion 2 after performance(p2). After performance on Occasion 2 when reward was offered, the intrinsic motivation of the younger students increased significantly more than that of the older students. It might be that the larger improvement in performance for the younger students contributed to the higher level of intrinsic motivation for them at this time. It could also be that the extrinsic reward had a greater influence for the younger students.

In summary, when result were analysed separate from for the model for the relationship between reward, perceived competence and intrinsic motivation (fig 5.9), reward significantly influenced perceived competence (pc2) and intrinsic motivation (im3), and perceived competence significantly influenced intrinsic motivation (im3). Also, separate results were evaluated for the relationship between reward, performance, perceived competence and intrinsic motivation (Fig5.10). Reward still affected all variables significantly in the same patterns. Furthermore, perceived competence mediated the change in intrinsic motivation. As additional variables were added to the model (Fig5.11, 5.12, 5.14, the causal influence of perceived on intrinsic motivation was no longer found to be significant. Most importantly, when reward was removed (Fig 5.13), performance significantly influenced perceived competence and intrinsic motivation, but perceived competence did not mediate the effect on intrinsic motivation.

The overall model indicated that previous performance, perceived competence and intrinsic motivation had a significant influence on the subsequent measure of performance, perceived competence or intrinsic motivation. Extrinsic reward significantly influenced performance, perceived competence and intrinsic motivation on Occasion 2. The relationship between performance and perceived competence and that between perceived competence and intrinsic motivation were not significant (p=0.05) in the overall model as they were in some versions of the partial models.

5.3.5. Examination of Goodness of Fit.

LISREL structural equation modelling analysis also permits examination of the goodness of fit of the data to the proposed model. Table 6.2 presents the goodness of fit results for the overall model. The first index is the chi-square statistic which compares the underlying covariance of the data with the covariance structure of the proposed model. The chi-square ratio to fit, calculated by dividing chi-square by the degrees of freedom is almost 1. According to Byrne (1989), Joreskog (1969) and Sarris and Stronkhorst (1984), if the chi-square ratio is less than 2.00 then the model of a good fit to the data. This index suggests that the model is a good fit.

Table 5.2

Goodness of fit for the whole model

Fit Index	Value
Chi-square value	49.91 (p=.477)
Degrees of Freedom (df)	50
Goodness of Fit Index	0.957
Adjusted Goodness of Fit Index	0.897
Root Mean Square Residual	0.057

There are a number of alternative measures of goodness of fit of a model which can be produced using LISREL. The Goodness of Fit Index (GFI) is 0.957, the Adjusted Goodness of Fit Index (AGFI) is 0.897 and the Root Mean Square Residual (RMSR) is 0.057. According to the values put forward in the literature (Byrne, 1989; Joreskog, 1989. Sarris and Stronkhorst, 1984) these also reflect a good fit of the data to the model, although some researchers would interpret a difference as small as .06 in the GFI and AGFI to be an indication of some limitation in the model (Vallerand, 1996, personal communication).

5.3.6. Discussion of Structural Equation Modelling Analysis.

The results of this study showed that extrinsic reward directly and significantly influenced both perceived competence and intrinsic motivation on Occasion 2. It is significant that perceived competence influenced intrinsic motivation only weakly when reward was provided. Extrinsic reward could directly influence both perceived competence and intrinsic motivation. That is, when reward is given for improving performance, subjects tend to change their perception temporarily. They are encouraged to put in more effort and have a more positive attitude towards the task. Consequently, they tend to supercede the previous performance, which in turn influences intrinsic motivation. While the thought of improving over previous performance tends to excite the subject.

However, in the present study, while the effect of extrinsic reward still remained when the LISREL modelling combined Occasion 1 with Occasion 2 the causal path from perceived competence to intrinsic motivation was no longer significant. It seems that the strength of the paths between repeated measures of the same variable, such as performance (p1) to performance (p2), perceived competence (pc1) to perceived competence (pc2) and intrinisic motivation (im2) to intrinisic motivation (im3), were so much stronger than the links between perceived competence and intrinisic motivation, that the perceived competence and intrinisic motivation link only attained significance when those performance-performance, perceived competence-perceived competence and intrinsic motivation-intrinsic motivation links were not modelled.

The most important part of the present study involved the effect of extrinsic reward on performance and how changes in performance affected perceived competence and intrinsic motivation. Although, Deci (1975) and Deci and Ryan (1980) suggested that explicit feedback from performance could mediate between reward and one's level of intrinsic motivation, only Vallerand and Blais (1986) tested the effect of evaluation of performance by the performer on competence related affect and intrinsic motivation. The present study is quite different from the study done by Vallerand and Blais (1986) because they only studied the effect of performance without tangible reward whereas the present study focused on the effect of performance when subjects were given reward. The effect of performance was not found to be significant for either perceived competence or intrinsic motivation. These results suggest that subjects focused on the information given by the extrinsic reward rather than the information provided by actual performance. Thus, the reward directly influenced perceived competence and intrinsic motivation, as well as performance, and performance did not appear to affect perceived competence or intrinsic motivation.

When reward was withdrawn, after retesting perceived competence and intrinsic motivation following the three weeks break, performance had a significant effect on both perceived competence (pc4) and intrinsic motivation (im5), according to the partial model tested in Figure 5.12. This could be because subjects improved their skill and had more experience which made the subjects feel more competent. This would, in turn, influence both perceived competence and intrinsic motivation. This result is consistent with the study by Vallerand and Blais (1986), who found that the evaluation of performance has a significant influence on both perceived competence and intrinsic motivation. This significant effect, however disappeared when the full model was examined in Figure 5.14.

The overall model suggests that the effect of performance on the first and second occasions significantly influenced following performance. Perceived competence and intrinsic motivation also followed the same pattern. It is not clear why performance had no significant effect on either perceived competence or intrinsic motivation. Perhaps the actual improvements in performance were not large enough to be salient, whereas the reward was specifically given in a manner which gained attention.

In general, LISREL provide a much more comprehensive way of testing the significance of the causal paths than the multiple regression methods considered previously. The LISREL model allows each path to be tested for significance and gives statistics that can be used to evaluate whether the model provides a good fit the data. All paths are encompassed in one single (matrix) equation and this allows a more unified approach to the statistical analysis. In this study, LISREL revealed how well the proposed model fitted the data. The Goodness of Fit Index was 0.957 which means that the model was a good fit to the data. In addition, the Adjusted Goodness of Fit Index, which takes into account the degrees of freedom, was 0.897, only slightly reducing the goodness of fit value. This value is however quite acceptable as it is close to 1.0 and a good fit. The Root Mean Square Residual is directly based on the residuals which indicate the average difference between the factors in the observed model and the hypothesised covariance matrices. The value of RMSR becomes close to zero when indicating a good fit of the model to the observed data. Sarris and Stronkhost (1981), however, stated that it is hard to identify how large the RMSR value should be to indicate a bad fit of the model to the data. Also, Byrne (1989) suggested that the value of RMSR is usually not considered in determining whether the model is a good or bad fit. According to Byrne (1989), less than 0.05 for the value of RMSR is acceptable, but it is not often relied upon for deciding the model fit because wrong models can also show values less than 0.05. The RMSR value of 0.057 suggests that the model is not a good fit, although it does approach 0.05. Taken together the goodness of fit indices suggest that the model is a fairly good fit to the data.

Further research is needed to investigate the effect of performance on perceived competence and intrinsic motivation in comparison with the effect of extrinsic reward. Cognitive Evaluation Theory (Deci 1975; Deci & Ryan 1980) only states that performance can mediate between perceived competence and intrinsic motivation, and does not expand much on the issue. Vallerand and Blais (1986) did examine the role of performance, but not when reward was given. In views of the central position of performance in sport, more empirical evidence, achieved through field experiment is needed to clarify the role of performance in variation of perceived competence and intrinsic motivation.

In summary, when the results were analysed for each separate model, when reward was given, it had a considerable influence both on perceived competence and on intrinsic motivation, and perceived competence also significantly boosted intrinsic motivation, although to a lesser degree than the direct effect of extrinsic reward on the latter. When performance was included in the relationship of reward, peceived competence and intrinsic motivation, it was observed that in the long term no significant change in the relationship appeared, except that performance significantly influenced perceived competence and intrinsic motivation when reward was removed. At that time, no significant change was observed in the influence of perceived competence on intrinsic motivation. It is noteworthy that the relationship between performance, perceived competence and intrinsic motivation was changed significantly when the reward was withdrawn. The results of the present study suggest that the monetary extrinsic reward presented in a performance-contingent manner was more salient to subjects than their perception of their own performance.

6.4.7 Overall Conclusion Regarding Experiment 1

In the results of the ANOVA, Path and LISREL analyses the performance-contingent monetary reward had a significant and positive effect on performance, perceived competence and intrinsic motivation in the long term, and this effect was maintained until the reward was removed. Performance-contingent reward is clearly related to subjects performance mastery of the task and thus could lead to more competence at the task, leading to increased intrinsic motivation. Each variable, performance, perceived competence and intrinsic motivation, showed a strong relationship with subsequent measures of the same variable. This was evident in all three analyses. There did not seem to be any changes in performance, perceived competence and intrinsic motivation over the duration of the study due to sources external to the study. On the other hand, it was evident that extrinsic reward had a signifiacnt long term effect on each variable. This effect was continued when monetary reward was removed.

All results discussed above were observed in both the ANOVA and path analyses. However, the causal modelling gave a much more detailed examination of the sequence of causations involved and thus adds to the information obtained from the experiment. The path anlysis results were obtained both through multiple regression techniques and using LISREL. Although both analyses gave similar (and in many cases identical) results, the LISREL analysis provided better assessment of the overall fit of various models to the data. Analysis of partial models showed that when extrinsic reward was removed, then performance had a significant effect on perceived competence, as expected, but also on intrinsic motivation, which was not expected. This was not tested through multiple regression anlysis but the results would be expected to agree qualitatively. This latter result was also found by Vallerand and Blais (1986). Clearly this result needs further exploration and examination. As a tool, the LISREL analysis should be better suited to making appropriate changes in the model. Assessments of the overall fit of the entire model was supplemented with checks of partial models, again using the LISREL methodology. The diagnostic statistics of the whole model, more fully discussed in 5.4.5, can be considered as acceptable. Nonetheless, there is reason for some concern in the scale of the differences between the GFI and the AGFI values. This caould lead to concern about the full model. This does depend on the level of sophistication of LISREL analysis. More recently, highly sophisticated modelling research has produced very small differences. Thus, standards of acceptability are changing. in the present circumstances, it is reasonable to accept the model with caution. The overall model is thus able to be interpreted with only with a degree of confidence. As indicated, further research is needed to confirm the results obtained.

Chapter 6. The Effects Of Positive And Neutral Verbal Feedback On Intrinsic Motivation, Perceived Competence And Sport Performance

6.1. Introduction

From the previous study it is clear that the effect of a monetary reward on performance, perceived competence and intrinsic motivation in basketball free throw shooting was substantial. However, it is rare for school children, students and sports performers, other than professionals, to be rewarded by monetary rewards. It is more common that verbal feedback is used by coaches and teachers to motivate both sport performers and students to improve sport performance. A positive verbal reinforcement, such as praise or approval, is defined as any stimulus which increases the probability of occurrence of a desired response. A negative verbal reinforcement, such as punishment or reproval, is understood as any stress which removes or reduces the strength of a response (Martens, 1975). It follows from the previous results and comments that to examine how social reinforcements, such as verbal feedback, influence sport performance and motivation is important.

The effect of extrinsic verbal feedback on performance has been widely studied. The results of some of that research suggests that the effect of verbal positive feedback in comparison to either negative or no feedback did not significantly influence performance (Macy, 1973; Martens, 1970, 1972; McGauhan, 1983; Roberts & Martens, 1975). In contrast, in number of studies positive feedback increased performance significantly in comparison to the negative and no feedback (Fitzsimmons, Lander, Thomas & Mar, 1990; Hill & Stevenson, 1975; Martens, Burwitz & Newell, 1972; Nass & Pattern, 1977; Sohi, 1976). Closer scrutiny of these results suggests that positive feedback increased performance when the task was simple and almost fully controlled by the participants, e.g., marble dropping, (Martens, 1975). Results also suggest that complex tasks e.g., balancing on a stabilometer (Martens, 1975), which are more difficult to learn, were not influenced by positive feedback, at least initially. Skill in performing such a task is dependent more on knowledge of results or visual and kinaesthetic information.

The tasks used in the studies above were mainly motor tasks which are typically different from most sport activity. In sport, Rushall and Pettinger (1969) found swimming performance was increased significantly by positive feedback. Vallerand (1987) suggested that verbal feedback presented frequently may lead to a greater increase in subjects' level of arousal than does a moderate level of verbal feedback. Verbal feedback presented at a high frequency can cause subjects to get used to its presentation and this can also lead to decreased arousal. Giving positive feedback frequently might also mean giving it at times when performance does not warrant a positive comment, thus leading recipients to doubt the veracity of the feedback. Thus, both high and low levels of arousal are likely to decrease performance. In other words, positive feedback should be used only moderately and appropriately in order to improve performance. For teachers and coaches interested in improving performance, the application of these findings could be very beneficial, but their application is still equivocal and further research is warranted.

Research investigating the effect of verbal feedback on perceived competence and intrinsic motivation has tended to give support to the Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985), which suggests that positive feedback facilitates intrinsic motivation, whereas negative feedback decreases intrinsic motivation. Research by Vallerand (1983), Vallerand & Reid (1983, 1988), and Whitehead & Corbin (1991) found that positive feedback increased perceived competence and intrinsic motivation. In addition, each of these studies, used path analysis, to show that the effect of positive feedback on the level of intrinsic motivation was more strongly reflected in the paths from feedback to perceived competence and then from perceived competence to intrinsic motivation than by the path from feedback itself to intrinsic motivation. This supported the claim that perceived competence is a mediating variable between feedback and intrinsic motivation.

The relationship between feedback and performance, perceived competence and intrinsic motivation may be more complex. When participants view positive feedback as a reflection of their competence, intrinsic motivation is increased, according to the previous work. Previous research has largely ignored the effect of knowledge of performance and knowledge of result arising from performance as feedback factor themselves. It can be hypothesised that improved performance might act as a direct source of positive feedback which in turn enhances perceived competence. Higher perceived competence, then should enhance intrinsic motivation. Research is needed to test these predictions.

Research has also investigated the effect of feedback on performance, perceived competence and intrinsic motivation in different age groups. Considering that children and adolescents apparently use different cognitive-developmental processes, researchers have expected that the younger and older adolescents' performance and motivation could be differentially influenced by external factors such as reward and social reinforcement. Thus, it is necessary to take note of how age-related differences in performance are related to motivation using verbal social reinforcement.

Studies of college students with respect to the effect of verbal feedback on performance, competence and intrinsic motivation (Vallerand, 1983, 1987; Vallerand & Reid, 1984, 1988) found that positive feedback increased performance, perceived competence and intrinsic motivation in sports. In addition, Martens, Burwitz & Newell (1972) found that positive feedback increased performance of motor tasks (rotary pursuit), while Fitzsimmons, Landers, Thomas & Mars (1990) found the same result in connection with weight-lifting. The above results were similar to those of Gill & Martens (1975), Shoi (1976), and Wankel (1975). Rushall and Pettinger (1969) found that the swimming performance of participants 13 years and older were relatively more affected by social verbal reinforcement than by tangible reward. Whitehead and Corbin (1991) also found that participants aged 12 to 13 years increased in perceived competence and intrinsic motivation when provided with positive feedback about the physical activity under test (Illinois Agility Run).

The results of previous studies indicate that positive feedback tends to increase performance, perceived competence and intrinsic motivation regardless of age. However, the same studies show that intrinsic motivation of older groups is more influenced by their own perceived competence than by social reinforcements. On the other hand, younger groups rely much more on external positive feedback to evaluate the level of their performance. Martens (1975) noted that the performance of younger children was more affected by social reinforcement in motor tasks than it was for older children.

A review of previous studies on the effect of positive feedback on performance, perceived competence and intrinsic motivation of males and females indicates mixed results. Changes in social role seem to affect one's response to positive feedback. Early research (e.g., Deci, 1972; Deci, Casio & Krusell, 1975) found that male college students become more highly motivated by positive feedback, whereas it was just the opposite with the female participants. Deci, et al. (1975) proposed that the difference was due to the perception of their social roles by the two genders. More recently, however, Blank, Reis, and Jackson (1984), found both males and females were positively influenced by positive feedback. They argued that due to changes in social perception, influenced by the feminist movement, the gender difference no longer existed, that is, both genders were equally encouraged by positive feedback because they were both achievement-oriented. It should be noted that the nature of the participants is also likely to influence their interpretation of positive verbal feedback, e.g., Vallerand and Reid (1988) had the same findings in the realm of sports that Harackiewicz (1979) and Blank, et al, (1984) found in the realm of puzzle-solving. This is likely to be due to the fact that in sport males and females are equally achievement-oriented, hence, they are both encouraged by positive feedback, which heightens their motivation and performance.

Another issue for this study was to consider the long term effect of feedback on performance and intrinsic motivation. Further, the effect of removing reward was examined again. Due to concern for the immediate effect of verbal feedback on performance and motivation, coaches and teachers are inclined to overlook the long term effect of reward. Common sense proves that the ultimate or longterm result of verbal feedback is what counts in athletics. If motivation, therefore, could be attained without dependence on reward, then athletes need to be trained not to depend on reward for their performance. While reward may be used initially to motivate athletes, skills and motivation should be developed ultimately apart from reward. However, if this approach proves to be too difficult with some athletes, then some variation on the degree of reward may be utilised.

Little research has been done on the effect of verbal feedback on sport performance and intrinsic motivation. Existing studies (Vallerand, 1983, 1987; Vallerand & Reid 1984, 1988; Whitehead & Corbin, 1991) have been reviewed earlier in the literature chapter. They seem to focus only on the immediate effect of verbal feedback on intrinsic motivation. Whitehead and Corbin (1991) measured intrinsic motivation right after reward was provided without considering the initial level of intrinsic motivation in the pertest, whereas Vallerand and Reid (1984) tested the effect of verbal feedback three weeks after the pretest, choosing participants with moderate level of intrinsic motivation. However, their findings on the longterm effect of reward were inadequate because the measurement were taken immediately after the verbal feedback. Vallerand and Reid (1988), followed the same procedure in another experiment. From both studies, they found that positive verbal feedback increases intrinsic motivation. None of studies measured the level of performance independently; which if done, may have had some influence on intrinsic motivation. This oversight may justify the definition of long term and removal of reward effects.

The first study of this present thesis revealed that monetary reward had a positive effect on long term performance, perceived competence and intrinsic motivation, and that effect was maintained even after the removal of reward.

To summarise previous studies, they tend to focus mainly on non-sport areas, such as puzzle solving and laboratory motor performance. Therefore, it is necessary to examine the effect of verbal feedback on intrinsic motivation in sport for different genders and ages because sport can be attractive for all regardless of gender or age. The aim of Experiment Two was to compare the effect of positive verbal feedback and neutral verbal feedback on performance, perceived competence and intrinsic motivation. Age, gender, the long term effect of verbal feedback and the effect of removing reward were also examined.

6.2 Hypotheses

Specifically, the effects of positive feedback and neutral feedback on performance, perceived competence and intrinsic motivation in the immediate and longer term are examined on Year 10 and Year 7 male and female adolescents in order to test the following hypotheses, which are stated in the alternative form to indicate the nature of hypothesised differences which were predicted. All hypotheses were tested at the 0.05 significant level.

6.2.1. Performance

6.2.1.1. Main Effects.

Age: Performance of Year 10 students is significantly superior to Year 7 students.

Sex: Performance of males is significantly superior to that of females.

Treatment: Performance of the Positive Feedback group is significantly superior to performance of the Neutral Feedback group

Time: There is a significant increase in performance from Occasion 1 to 2.

6.2.1.2. Interaction effects.

Performance of the Positive Feedback group improves significantly more between Occasion 1 and 2 than that of the Neutral feedback group.

6.2.2. Perceived Competence

6.2.2.1. Main Effects.

Sex: Perceived Competence of Males is significantly higher than that of Females.

Treatment: Perceived Competence of the Positive Feedback group is significantly superior to the Neutral Feedback group.

Time: There is a significant increase in perceived competence from Occasion 1 to 2.

6.2.1.2. Interaction Effects.

Perceived Competence of the Positive Feedback group improves significantly more between Occasion 1 and 2 than that of the Neutral Feedback group.

6.2.3. Intrinsic Motivation

6.2.3.1. Main Effects.

Age: Intrinsic Motivation of Year 7 students is significantly higher than that of Year 10 students.. Sex: Intrinsic Motivation of Males is significantly higher than that of Females.

Treatment: Intrinsic motivation of the Positive Feedback group is significantly superior to that of the Neutral Feedback group.

Time: There is a significant increase in intrinsic motivation from Occasion 1 to 2.

6.3.2.2. Interaction Effects.

Intrinsic motivation of the Positive Feedback Group improves significantly more between Occasion 1 and 2 than that of the Neutral Feedback group.

6.3. Method

6.3.1. Participants

A total of 246 students from a Melbourne western suburb secondary school, consisting mostly of children with middle class socio-economic backgrounds, were tested in the initial phase of this study for basketball shooting performance and intrinsic motivation, as in Experiment 1. Students, who showed at least a moderate level of motivation (M=46) in basketball free throw shooting were selected as participants. A final sample of 176 students was selected, but only 159 students participated on all three occasions because of a variety reasons, including school study commitments, absence or ill-health. The final sample, thus, consisted of 159 students. For each of the four age-sex combinations, students were randomly allocated into positive and neutral feedback conditions. The age, gender and treatment distributions of these participants are displayed in Table 6.1.

Table 6.1. Sample by Age, Sex and Experimental Condition (N= 159)

Grade	Sample		Positive group		Neutral Group	
	Male	Female	Male	Female	Male	Female
Year 7.	39	40	20	20	19	20
Year10	39	41	20	21	19	20.

6.3.2. Research Design

A 2 x 2 x 2 x 3 repeated measures factorial design was used with three between groups factors, age, sex and treatment, and one repeated measure, occasion of testing. The between groups factors had two levels each, which were Year 10, Year 7 for age, Male and Female for sex and for treatment they were Positive Feedback and Neutral Feedback. The within groups factor, occasion, had three levels as basketball performance, perceived competence and intrinsic motivation were each measured, once on each of three occasions. The first and second occasion were separated by four days and the second and third occasion were separated by two weeks for each participant.

It should be noted that this experimental design is different from that used in Experiment 1 in a number of ways. Because it was found in Experiment 1 that no significant changes occurred in intrinsic motivation between testing on Occasion 1 and testing at the start of Occasion 2, two weeks later, or between testing at the end of Occasion 2 and the start of Occasion 3, three weeks later, it was considered to be unnecessary to include testing at the start of Occasion 2 and 3 for Experiment 2. Similarly, analysis in Experiment 1 indicated no significant change in perceived competence between the end of Occasion 2 and the start of Occasion 3, so testing of perceived competence before performance on Occasion 2 and 3 was omitted. In order to test for treatment effects on perceived competence and its mediating effect on intrinsic motivation, perceived competence was additionally measured after performance and before intrinsic motivation on Occasion 1. This also produced a conceptually simpler model, which was the same on each occasion, while all main effects, interactions and relationships of interest could still be examined. The longer term effect of extrinsic reward on perceived competence and intrinsic motivation before further performance was, thus, not examined directly in this design. Rather, it was inferred by testing perceived competence and intrinsic motivation after performance without reward on Occasion 3. The causal path analysis was of particular value here.

6.3.3. Measurement.

6.3.3.1. Basketball performance.

Basketball performance was measured exactly as in Experiment 1. See section for a detailed description of the procedure and scoring method employed.

6.3.3.2. Perceived competence.

Perceived competence scale was measured exactly as in Experiment 1. See section for a detailed description of the procedure and scoring method employed.

6.3.3.3. Intrinsic motivation.

Intrinsic motivation scale was measured exactly as in Experiment 1. See section for a detailed description of the procedure and scoring method employed.

6.3.3.4. Procedure.

After receiving permission from the school to conduct the research, students in the relevant classes were told the purpose of the study and the procedure they would carry out. They were then asked to participate if they wished. Those that agreed to take part signed an informed consent form. This study was conducted in three stages over a period of two weeks as was the previous study.

Occasion 1: The initial stage was designed to select those with moderate intrinsic motivation in regard to basketball performance. Participants entered the school gym individually and were given instructions about how to shoot the basketball and scoring baskets, but not the points scoring method. Practice and test shooting procedures were exactly the same as they were in the previous study: four practice shots, followed by twenty shots. Participants were then asked to fill in the single item Perceived Competence Scale and the eleven item modified Intrinsic Motivation Inventory. Between this stage and Occasion 2, all those scoring at least moderately on the IMI (46 or greater) were invited to return four days later. Those who returned were randomly assigned to Positive and Neutral feedback conditions by age and sex.

Occasion 2: Procedures in this stage were similar in all respects to procedures on Occasion 1, except that Positive and Neutral Feedback were presented. Positive Feedback consisted of information about performance plus verbal rewards in the following form: "Your score in the last session was xx baskets. You are the best out of the number of students tested in the last session." The neutral feedback consisted of informing participants of the exact score they achieved "Your score in the last session was xx baskets." After the basketball performance test, students again filled in the Perceived Competence Scale followed by the Intrinsic Motivation Inventory. Participants were not told their scores on the previous occasion, so they had no feedback.

Occasion 3 : Two weeks later students were again tested for basketball shooting with no verbal reward offered or given. They then completed the Perceived Competence Scale and the Intrinsic Motivation Inventory. Participants were debriefed and thanked for their participation.

6.4. Results

Results were analysed using Multivariate Analysis of Variance (MANOVA) with three between groups factors, age, sex and treatment and one within participant factor, occasion. The dependent variables were performance, perceived competence and intrinsic motivation. As this analysis was significant for each dependent variable ($p<0.05$), Univariate Analysis of Variance (ANOVA) was executed for each dependent variable. Scheffe's follow up post hoc test was conducted to identify the specific location of significant differences. All the analyses were performed using the SAS statistical package.

6.4.1. Performance

The means and standard deviations for performance of all groups on all occasions are presented in Table 6.2.

Table 6.2.

Means and Standard Deviations by Sex, Age, Treatment and Occasion for Basketball Free Throw Shooting Performance (N=159)

		Occasion 1		Occasion 2		Occasion 3	
Group	Size	Mean	SD	Mean	SD	Mean	SD
Males Year 7							
Positive	20	51.55	8.49	56.60	10.42	59.60	11.6
Neutral	19	52.37	8.85	53.75	8.39	56.00	9.70
Males Year 10							
Positive	20	55.65	9.74	59.60	10.39	62.55	10.5
Neutral	19	55.58	8.70	55.63	8.40	58.78	8.95
Female Year 7							
Positive	20	49.00	9.70	52.67	9.59	55.25	9.56
Neutral	20	49.01	10.96	50.45	10.68	51.20	10.6
Female Year 10							
Positive	21	50.95	8.43	53.15	8.25	54.90	8.48
Neutral	20	50.55	10.98	51.60	11.36	51.90	11.4

The performance of the Positive Feedback Group increased substantially from Occasion 1 to Occasion 2 when positive feedback was given before Occasion 2 performance. There was a further noteworthy increase from Occasion 2 to Occasion 3. The performance of the Neutral Feedback Group did not change markedly between

Occasion 1 and 2. There was an increase for this group from Occasion 2 to Occasion 3, but it was not as large as that for the Positive Feedback Group: The mean performance for the Positive Feedback Group of Year 7 and Year 10 Males improved more than those of Year 7 and Year 10 Females..

Table 6.3

Mean Performance for Males and Females (N=159).

Gender	N	Mean	SD
Male	78	56.55	8.34
Female	81	51.62	10.05

The means of Year 7 Females in the Positive Feedback Group improved markedly more across time compared to those of the Year 10 Females in the Positive Feedback Group, specially from Occasion 2 to Occasion 3. Standard deviations of performance generally increased over occasions, particularly for males, perhaps suggesting that those with more ability in sporting activities improved at a greater rate than the other students and this was more evident for Males. Based on the observable patterns in Table 6.2, further examination of main effects and interactions was conducted.

Table 6.3 presents the means for both sexes indicating that mean performance for Males was superior to that for Females. The Univariate Analysis of Variance revealed that there was a highly significant main effect for sex ($F(1,151) = 9.87$, $p<0.002$). Table 6.2 indicates that males scored higher from the start and maintained their performance advantage across all three occasions. This could be due to several factors including greater interest of males in Basketball, greater physical strength and height of males or more experience and practice of the basketball shooting skill by Males

Table 6.4 shows that the mean performance for all groups improved more between Occasion 1 and 2 than between Occasion 2 and 3. Univariate Analysis of Variance confirmed that there was a highly significant main effect for time (F (2,150) = 121.5080, p<0.0001). A Scheffe's post hoc test revealed a significant difference between Occasion 1 and 2 (p<0.05) and between Occasion 2 and 3 (p<0.05).

Table 6.4.

Mean Performance Over All Occasions for the Sample (N=159)

Occasion	1	2	3
Mean	51.83	54.30	56.27

Table 6.5 shows mean performance for both Positive Feedback and Neutral Feedback Groups across all occasions. The main effect for treatment did not reach significance (p=0.05). There were a number of significant interaction effects. Univariate Analysis of Variance revealed a highly significant interaction effect of treatment by occasion (F(2,150)=21.30, p<0.05) A post hoc comparison using Scheffe's test (p<0.05) indicated significant increases in mean performance between Occasion 1 and 2, and Occasion 2 and 3 for both the Positive Feedback and Neutral Feedback Group, although the increases between Occasion 2 and 3 were smaller than the increase between Occasion 1 and 2. Using a Scheffe's post hoc test (p<0.05), the increase between Occasion 1 and 2 for the Positive Feedback Group was greater than the corresponding

increases between occasion 2 and 3. Similarly, the increase between Occasion 2 and 3 for the Positive Feedback Group was greater than the corresponding increases for the Neutral Feedback Group.

Table 6.5.

Mean Performance Score For Positive Feedback And Neutral Feedback Groups (N = 159)

Group	Size	Occasion 1		Occasion 2		Occasion 3	
		Mean	SD	Mean	SD	Mean	SD
Positive	81	51.79	9.09	55.51	9.71	58.08	10.07
Neutral	78	51.88	9.87	53.11	9.71	54.47	10.18

As shown in Figure 6.1, the mean performance for the positive feedback group had a greater increase between Occasion 1 and 2 than that of the Neutral Feedback group. After this period there is no difference between the two groups.

Figure 6.1

Figure 6.1: Mean performance difference for positive feedback and neutral feedback group on occasions 1-3.

Table 6.6 presents mean performance scores comparing both sexes over all occasions. The mean performance for Males improved more between Occasion 1 and 2 than that of Females. Male performance also improved more between Occasion 2 and 3, compared to female performance. A Univariate Analysis of Variance confirmed a highly significant interaction effect of time by sex ($F(2,150) = 7.80$, $p<0.0001$). Scheffe's post hoc test indicated a significant difference ($p<0.05$) in the performance of Males between Occasion 1 and 2 and Occasion 2 and 3. The mean difference for Females was also significant ($p<0.05$) between Occasion 1 and 2 and Occasion 2 and 3. Scheffe post hoc tests ($p<0.05$) showed, however, that the difference between Occasion 1 and 2 for Males was significantly larger than the difference between Occasion 1 and 2 for Females, and the difference between Occasion 2 and 3 for Male was significantly larger than the Occasion 2 and 3 difference for Females.

Table 6.6

Mean Performance Score by Sex and Occasion 1, 2 and 3 (N = 159)

Group	Size	Occasion 1		Occasion 2		Occasion 3	
		Mean	SD	Mean	SD	Mean	SD
Males	78	53.79	8.94	56.64	9.4	59.23	10.22
Females	81	49.88	9.99	51.97	9.97	53.31	10.03

The overall results for performance revealed that sex was a significant factor ($F(1,151) = 9.87$, $p<0.0020$), confirming that Males outperformed Females. Hence, hypothesis 1.1.2 that Male performance would be superior to that of Females has been confirmed. Occasion was also found to be significant ($F(2,302) = 121.5080$, $p<0.0001$), indicating that improvements in performance between Occasion 1 and Occasion 2, and between Occasion 2 and 3 were substantial. This suggests that performance was affected by a practice effect as well as by feedback. Age was not found to be significant which is contrary to the findings of Experiment 1. These findings may reflect differences in students' background and social location. The hypothesis that Year 10 students, that is, older students, outperform younger students was not supported, however, the mean of the Year 10 participants was higher than that of their Year 7 counterparts.

There were two highly significant interaction effects, treatment by occasion ($F(2,302) = 34.28$, $p<0.0001$) and sex by occasion ($F(2.302) = 9.97$, $p<0.0003$) hence, hypothesis 1.2.1 that performance of the Positive Feedback Group improves significantly more between Occasion 1 and 2 compared to the Neutral Feedback Group was accepted. The interaction effect of sex by occasion indicated that male performance improved significantly more across all occasions than female performance.

6.4.2. Perceived competence

Table 6.7 shows the post performance means and standard deviations for perceived competence over the three occasions, for the two treatment groups, the two ages and the two sexes. The mean of perceived competence of the Positive Feedback Group improved more between Occasion 1 and 2 compared to that of the Neutral Feedback Group. The largest improvement for any single group and occasion occurred between Occasion 2 and 3 in the Year 7 Female Positive Feedback Group. Year 10 Males Positive Feedback Group improved most between Occasion 1 and 2. Standard deviations showed a trend for reduction across occasions, suggesting that with experience within group homogeneity increased. In other respects the standard deviations do not reveal noteworthy patterns. In future tables in this section, only means are presented to depict trends.

The mean of perceived competence increased gradually over all occasions. The mean of Females the Year 10 Neutral Feedback Group seemed to improve only slightly between Occasion 2 and 3. The mean difference of perceived competence between Occasions 1 and 2 was greater than the corresponding mean between Occasion 2 and 3 in all groups, except Females in Year 10 in the Neutral Feedback Group. The mean of perceived competence for Positive Feedback Group increased more than that of the Neutral Feedback Group. The mean for Males Year 7, Males Year 10 and Females Year 7 in the Positive Feedback Group improved most between Occasion 1 and 2. The mean of perceived competence between Occasion 2 and 3 improved most for Males in Year 10 in the Positive Feedback Group. Results suggest that information feedback might have had some effect on perceived competence, while motivational feedback had a supplementary influence. Information feedback refers to the extent to which the feedback given provides information about how to adjust task performance to improve the outcome. This might include guidance such as "throw higher" or "more length". Motivational feedback refers to the extent to which the feedback encourages the performer to try again or to make greater efforts. this might involve comments like "great shot" or "good effort, same again". In the present context, it could be that positive feedback provided information that the standard of performance was high, thus enhancing perceived competence, while the knowledge that one had performed well motivated the person to make increased effort next time. The mean of perceived competence was more influenced by positive feedback than by the monetary reward in Experiment 1, suggesting that of perceived competence is particularly affected by information directly referring to capability at the task.

A four-way Univariate ANOVA (2x2x2x3) was used to test for main effects and interactions with three between participant factors, sex, age and treatment, each with two levels, and one within participant factor, occasion of measurement of perceived competence with three levels.

Table 6.8 shows mean perceived competence for Males and Females for basketball free throw shooting over all occasions. The mean for Males was higher than that for Females. ANOVA indicated that there was a significant main effect for sex ($F(1, 151) = 4.60$, $p<0.0336$), whereby males reported significantly higher perceived competence values than those of females in basketball free throw shooting throughout the study.

Table 6.7.

Means And Standard Deviations By Sex, Age, Treatment And Occasion For Perceived Competence For Basketball Free Throw Shooting (N = 159)

		Occasion 1		Occasion 2		Occasion 3	
Group	Size	Mean	SD	Mean	SD	Mean	SD
Males Year 7							
Positive	20	4.65	1.14	5.50	1.10	5.95	0.94
Neutral	19	4.74	1.05	5.16	1.01	5.63	1.07
Males Year 10							
Positive	20	4.50	1.43	5.35	0.99	6.10	0.85
Neutral	19	4.74	1.28	5.16	1.01	5.47	0.90
Female Year 7							
Positive	20	4.55	1.10	5.40	0.96	6.00	0.86
Neutral	20	4.25	1.52	4.70	1.26	4.90	1.07
Female Year 10							
Positive	21	4.24	1.34	4.95	1.20	5.52	0.93
Neutral	20	4.60	1.23	4.85	1.09	4.75	1.37
Overall Mean	159	4.54		5.13		5.54	

Table 6.9 shows that the mean for perceived competence for the Positive Feedback Group was higher than that of the Neutral Feedback Group. The results of the Univariate Analysis of Variance approached significance for treatment ($\underline{F}(1,151) = 3.65$, $\underline{p}<0.0579$).

Table 6.8.

Mean Perceived Competence For Males and Females (N=159)

Sex	Size	Mean
Male	78	5.25
Female	81	4.43

Table 6.10 shows that perceived competence means improved over time. Univariate Analysis of Variance revealed that there was a highly significant main effect for time ($F(2,150) = 137.58$, $p<0.0001$). A Scheffe's post hoc test ($p<0.05$) revealed that perceived competence increased significantly from Occasion 1 to 2 and Occasion 2 and 3.

Table 6.11 shows that the mean of the Positive Feedback Group was enhanced between Occasion 1 and 2 as compared to the Neutral Feedback Group. The mean of perceived competence for positive feedback was enhanced between Occasion 1 and 2 by 0.81 scale points, in comparison to the Neutral Feedback Group, which increased only 0.38 scale points between Occasion 1 and 2. Furthermore, between Occasion 2 and 3 the mean of perceived competence for the Positive Feedback Group increased 0.59 scale points compared to 0.23 for the Neutral Feedback Group.

Table 6.9

Mean Perceived Competence for Positive Feedback Group and Neutral Feedback Group (N=159)

Group	Mean
Positive (81)	5.23
Neutral (78)	4.91

A Univariance of Analysis of Variance revealed that there was a highly significant interaction effect for treatment by occasion ($F(2.302)=21.48$, $p<0.0001$). Scheffe's post hoc test revealed a significant difference between Occasion 1 and 2 and between Occasion 2 and 3 for the Positive Feedback Group.

Table 6.10.

Means Perceived Competence For Three Occasions (N=159)

Occasion	1	2	3
Mean	4.54	5.13	5.54

The difference between Occasion 1 and 2 in the Neutral Feedback Group was also significant but it was not significant between Occasion 2 and 3. Scheffe post hoc tests revealed that the difference between Occasion 1 and 2 for the Positive Feedback Group (0.81) was significantly greater than the corresponding difference for the Neutral Feedback Group (0.38), and similarly, that the difference between Occasion 2 and 3 for the Positive

Table 6.11

Mean Perceived Competence For Occasion By Treatment (N=159)

Occasion	1	2	3
Positive (81)	4.49	5.30	5.89
Neutral (78)	4.58	4.96	5.19

Feedback Group (0.59) was significantly greater than the corresponding difference for the Neutral Feedback Group (0.23).

Fig 6.2 represents two way interaction between treatment and occasion. The graph shows clearly that for the Positive Feedback Group the mean increased significantly more for perceived competence, whereas for the Neutral Feedback Group the mean of perceived competence increased, but only slightly.

Fig 6.2

. 6.2

Figure 6.2: Mean perceived competence between positive and neutral feedback groups for occasions 1, 2 and 3.

To summarise the results for perceived competence, only two significant main effects emerged. Sex was found to be a significant factor in perceived competence ($F(1,151) = 4.60$, $p<0.036$), indicating that perceived competence of Males was significantly higher than that of Females. There was highly significant interaction effect of treatment by occasion ($F(2.302)=21.48$, $p<0.0001$). Therefore, hypothesis 2.1.2 that perceived competence in Males is superior to Females was supported. Previous research supports this finding. The treatment did not quite reach significance ($F(2,302)=21.48$, $p<0.057$) reflecting that perceived competence in the Positive feedback Group was marginally higher than that of the Neutral Feedback Group.

The hypothesis that perceived competence of the Positive Feedback Group would be significantly superior to that of the Neutral Feedback Group was thus not supported strongly. Occasion was found to have a significant main effect ($F(2,150) = 137.38$, $p<0.0001$), indicating that perceived competence improved from Occasion 1 to 2 and Occasion 2 to 3. Age was not found to be significant for perceived competence.

Hence, hypothesis 2.1.1, that perceived competence in Year 7 students would be significantly superior to that of Year 10 students was not supported.

The interaction of treatment by occasion was highly significant ($F(2.302) = 21.48$, $p<0.0001$), indicating that the perceived competence scores across all occasions were different for the Positive Feedback and Neutral Feedback Groups. In the Neutral Feedback Group the difference for perceived competence was only significant for Occasion 1 to 2. Therefore, hypothesis 2.2.1 that perceived competence of the Positive Feedback Group improves more between Occasion 1 and 2 as compared to that of the Neutral Feedback Group was supported. Positive feedback consists of informational and motivational feedback, whereas neutral feedback only involves informational feedback. It appears that both informational and motivational feedback can affect perceived competence.

6.4.3. Intrinsic motivation

A four way repeated measures Univariate Analysis of Variance (2x2x2x3) was executed for intrinsic motivation with three between group factors, sex, age and treatment, each with two levels, and one within participants factor, occasion, with three levels. The IMI was administered on three occasions, after Occasion 1 performance, following performance on Occasion 2 and lastly after performance on Occasion 3.

The means and standard deviations for intrinsic motivation (IMI) scores are presented in Table 6.12 for all groups and all occasions. IMI scores improved for the Positive Feedback Group over all occasions compared to the Neutral Feedback Group. It was especially noticeable that the IMI mean improved most between Occasion 1 and 2 for the Positive Feedback Group. The mean of intrinsic motivation increased for all groups across occasions, except for Females in Year 10 in the Neutral Feedback Group, whose intrinsic motivation decreased from Occasion 2 to 3. The level of increase in intrinsic motivation in this experiment appears to be relatively small compared to the effect on intrinsic motivation in the first experiment. However, the mean of intrinsic motivation at the start of for this study appears to be slightly higher than that in the first experiment. In all comparisons, the Positive Feedback Group change was larger than the comparative Neutral feedback group change. In each age and gender block, the highest increase was for the Positive Feedback Group between Occasion 1 and 2. It is interesting that both the mean intrinsic motivation and perceived competence for Female in Year 10 decreased from Occasion 2 to 3. Results suggest that there was only a small effect of information feedback on intrinsic motivation, but that the effect of motivational feedback was greater in this study.

Table 6.13 shows that mean IMI scores between Occasion 1 and 2 improved more than IMI scores between Occasion 2 and 3.

Univariate Analysis of Variance revealed that there was a highly significant main effect for occasions ($F(2,302) = 103.81$, $p<0.0001$). A Scheffe's post hoc test indicated that there was a significant difference ($p<0.05$) between Occasion 1 and 2, and between Occasion 2 and 3.Table 6.13.

Mean for Intrinsic Motivation Over All Occasions (N=159)

Occasion	1	2	3.
Mean	54.07	55.68	56.61.
S. D	6.60	6.83	6.96

Table 6.12.

Means and Standard Deviations by Gender, Age, Treatment and Occasion for Intrinsic Motivation for Basketball Free Throw Shooting (N = 159)

Group	Size	Occasion 1 Mean	Occasion 1 SD	Occasion 2 Mean	Occasion 2 SD	Occasion 3 Mean	Occasion 3 SD
Males year 7							
Positive	20	55.55	8.16	59.00	8.50	60.90	8.75
Neutral	19	55.32	4.64	55.74	4.56	56.63	4.63
Males year 10							
Positive	20	54.40	5.88	57.20	6.72	58.60	7.23
Neutral	20	55.00	6.22	55.79	5.85	56.42	5.32
Females year 7							
Positive	20	55.35	7.43	57.60	7.76	59.34	8.44
Neutral	19	54.85	7.69	55.75	8.34	56.35	8.25
Females year 10							
Positive	21	51.52	5.69	53.29	5.27	54.19	5.74
Neutral	20	50.55	7.27	51.10	7.62	50.45	7.29
Overall Mean	159	54.07	6.60	55.68	6.83	56.61	6.96.

Table 6.14 shows that mean IMI for Year 7 was superior to that for Year 10. Univariate Analysis of Variance revealed that there was a significant main effect for age ($F(1,151) = 6.81$, $p<0.01$). This result may reflect greater novelty value for younger students who had less experience in basketball shooting.

Table 6.14

Mean Intrinsic Motivation for Year 10 and Year 7 Groups (N=159)

Year	N	Mean.
Year 10	80	53.5
Year 7	79	56.9

Table 6.15 shows that means of both age groups were more enhanced between Occasion 1 and 2 compared to those between Occasion 2 and 3. Univariate Analysis of Variance revealed a significant interaction effect of occasion by age ($F(2,302) = 4.12$, $P<0.0234$).

Table 6.15.

Mean Intrinsic Motivation of Year 7 and Year 10 Groups over Time (N=159)

Time	N	1	2	3
Year 10	80	52.87	53.35	54.91
Year 7	79	57.26	57.02	58.31

Scheffe post hoc tests showed that intrinsic motivation of Year 7 students increased significantly more ($p<0.05$) between Occasion 1 and 2 than did that of Year 10 tudents.

Figure 6.3

Figure 6.3: Mean intrinsic motivation between Year 7 and Year 10 group over occasions 1, 2 and 3.

Fig 6.3 shows the two way interaction effect between age and occasion. It appears that the mean intrinsic motivation for the younger student (Year 7) had a greater increase between occasion 1 and 2 in comparison with that of the older students (Year 10).

Table 6.16.

Mean Intrinsic Motivation For Males and Females (N=159)

Sex	N	Mean
Male	78	56.71
Female	81	54.18

Table 6.16 shows that Males had higher intrinsic motivation than Females. Univariate Analysis of Variance revealed that there was a significant main effect of sex ($F(1,151)=5.41$, $p<0.0214$). The results may reflect the greater challenge basketball shooting represents for adolescent males.

Table 6.17 presents the mean IMI scores of Males and Females across occasions. Overall, the mean IMI improved more between Occasion 1 and 2 than between Occasion 2 and 3. There was little change in the means between Occasion 2 and 3. The mean IMI score for Males was higher than that of Females. There was also a significant interaction effect of time by gender in the Univariate ANOVA (F (2.302) = 4.36, $p<0.0191$). Scheffe's post hoc tests showed that the increase in intrinsic motivation for Males from Occasion 1 to 2 was not significantly different to the increase in intrinsic motivation for Females from Occasion 1 to 2. Similarly, the increase in intrinsic motivation for Males from Occasion 2 to 3 was not significantly different to the increase in intrinsic motivation for Females from Occasion 2 to 3. However, the increase in intrinsic motivation for Males from Occasion 1 to 3 was significant greater than the increase in intrinsic motivation for Females from Occasion 1 to 3.

Table 6.18 presents mean IMI scores for treatment over Occasions 1, 2 and 3. With treatment, IMI was more enhanced for the Positive Feedback Group than for the Neutral Feedback Group over the three occasions. Univariate Analysis of Variance revealed a highly significant interaction of time by treatment ($F(2,302) = 36.50$, $p<0.0001$). Scheffe's post hoc test indicated that the differences between Occasion 1 and 2 and Occasion 2 and 3 were significant for the Positive Feedback Group.

Figure 6.4. represents the mean difference of intrinsic motivation between treatment and occasion. As can be seen, the mean difference between intrinsic motivation for the Positive Feedback Group was significantly greater between occasion 1 and 2 than that of the Neutral Feedback Group.

Table 6.17.

Mean Intrinsic Motivation for Sex Over All Occasions (N=159)

Occasion	N	1	2	3
Male	78	55.07	56.93	58.13
Female	81	53.07	54.41	55.08

The differences in means in intrinsic motivation for the Neutral Feedback Group were found to be not significant across any occasions.

Table 6.18.

Mean Intrinsic Motivation for Time and Treatment (N=159)

Occasion	N	1	2	3
Positive	81	54.20	56.77	58.26
Neutral	78	53.93	54.60	54.96.

Results for intrinsic motivation indicated main effects for age and sex and within participants for occasions. Year 7 students' intrinsic motivation was higher than that of Year 10 students. This result agree with propositions of Harter (1989), who suggested that children's motivation is increasingly extrinsic rather than intrinsic as they get older. Therefore, hypothesis 3.1.1 that the intrinsic motivation of Year 7 students would be significantly superior to Year 10 students was supported. Males displayed higher intrinsic motivation than Females, probably reflecting their greater challenge and interest in this task. Hence, hypothesis 3.1.2 that the intrinsic motivation of Males would be significantly superior to Females was supported by the results. The main effect of treatment was not significant, so the Positive Feedback group did not have higher levels of intrinsic motivation than the Negative Feedback Group over all occasions. The interaction effect of treatment by occasion was significant however, indicating that intrinsic motivation for the Positive Feedback Group improved more between Occasion 1 and 2 than that of the Neutral Feedback Group.

Therefore hypothesis 3.2.1 that the intrinsic motivation of the Positive Feedback Group would improve significantly more between Occasion 1 and 2 compared to the Neutral Feedback Group was supported by the results. The intrinsic motivation of the Neutral Feedback Group did not change significantly across occasions.

The results produced three significant interaction effects, first occasion by sex, indicating that across all occasions intrinsic motivation for Males increased more than it did for Females. Second, the interaction of occasion with treatment was also found to be significant, revealing that intrinsic motivation in the Positive Feedback Group increased more between Occasion 1 and 2 than any other groups or occasions comparison. Third, there was an interaction of occasion by age, indicating that Year 7 participants were affected more across occasions than Year 10 participants.

In summary, this study investigated the effect of positive feedback and neutral feedback on performance, perceived competence and intrinsic motivation and found in line with previous research that positive feedback does affect performance, perceived competence and intrinsic motivation. The research also found that positive feedback affected performance, perceived competence and intrinsic motivation more than neutral feedback, although neutral feedback did have some effect on perceived competence. This study also investigated the effect of positive and neutral feedback on performance, perceived competence and intrinsic motivation after removal of positive feedback in the longer term, in this case two weeks after the feedback was administered

Figure 6.4: Mean instrinsic motivation between positive and neutral feedback group over 3 occasions.

. The positive feedback treatment improved performance, perceived competence and intrinsic motivation across all occasions. However, the greatest improvement occurred in the intermediate test period, when positive feedback was presented to the participants. It was concluded that performance perceived competence and intrinsic motivation were maintained or improved in the treatment group, that received positive feedback, as shown two weeks after treatment and when feedback was removed before performance.

The overall results suggested that adolescent males and females perceived this task differently. Males were more challenged or interested than females. It is possible that performance is affected by the individual's ability or skill to perform this task rather than by age because males were also better at the shooting task than females at the start. Perceived competence is affected by feedback from improved performance and is not age related in this case. Age did not affect either performance or perceived competence. Possibly, both performance and perceived competence are affected by psychological development and the effect of skill development rather than age.

6.6. Discussion

The results of these ANOVA analyses provide evidence that positive feedback had considerable effects on performance, perceived competence and intrinsic motivation. Whilst there was no significant main effect of treatment on the three dependent variables, there was an increase for all three variables when positive feedback was provided, indicated by significant treatment by occasion interaction effects. The results for perceived competence and intrinsic motivation appeared to be consistent with Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985), which suggests that positive feedback increases perceived competence, which in turn increases intrinsic motivation. Vallerand & Reid (1984) showed that using path analysis, positive feedback enhanced intrinsic motivation through perceived competence as a mediating variable.

Both the Vallerand and Reid study and Cognitive Evaluation Theory itself focus on the effects of extrinsic rewards (feedback in the Vallerand and Reid study) on perceived competence and intrinsic motivation. In performance tasks, the effect of extrinsic reward on performance is also important. Positive feedback frequently enhances performance. Such an increase in performance could raise perceived competence and this, according to Cognitive Evaluation Theory, should lead to an increase in intrinsic motivation. Level of performance is an important factor in the learning and performance of sports skill and feedback plays a role in that process. Thus, verbal feedback was examined separately in this study. Overall, for performance, there was no significant treatment main effect. There was a significant interaction effect of treatment by occasion (Hypothesis 6.2.1.1). The performance of the Positive Feedback Group increased significantly when positive feedback was given, whereas the performance of the Neutral Feedback Group changed little at this time. This indicates that participants perceived the positive feedback in a motivational fashion, and were encouraged to exert more effort to improve their performance. This finding is consistent with previous research (Adams, 1972; Catano, 1975; Daniel, 1973; Sohi, 1976; Stock, 1978). Verbal feedback might serve as a stimulus to the performer to exert more in the task. The task used in the present study was a rather mechanical activity. It is noteworthy that the mean of performance for the Positive Feedback Group maintained the previous level of the performance even when verbal feedback was removed. Previous research did not pay attention to the effect of the removal of verbal feedback on performance. However, in this study perceived competence and intrinsic motivation were not tested after the delay and before performance, because study one showed that there were no difference in perceived competence and intrinsic motivation between the period when reward was provided and the period before reward was removed, which is referred to here as the longer term effect of reward. It was assumed that the longer term effect of reward on perceived competence and intrinsic motivation in the present study was similar to that in the first study and to the effect of the removal of reward on these variables, because there was no difference between the reward period and the period of removal of reward. It is unlikely that reward declined or increased during the two week delay only to return to its level before that delay when tested again after performance on Occasion 3. It is possible that the improved performance over the longer term and after removal of the reward was caused by two factors, namely, practice and or motivation. In this case, it appears that when the task is well mastered with practice by the participants, motivational factors become more salient (Gill & Martens, 1975). This might lead to the production of superior performance. Since this is speculative, the need for further investigation in this field is clear. Participants might view acquired skills as reflection of their competence in the activity, which could reinforce intrinsic motivation. It is possible that as the participants notice progress in their performance, their morale is boosted, increasing their intrinsic motivation.

There was a significant main effect of occasion for perceived competence (Hypothesis 6.2.2.1, time). Perceived competence was significantly higher in the intermediate period compared to the baseline period. It appears that positive verbal feedback had a strong positive effect when it was given. The main effect of treatment condition on perceived competence did not quite reach significance (Hypothesis 6.2.2.1), but there was a trend for the positive feedback condition to be associated with higher levels of perceived competence. This could be due to the effect of positive feedback on Occasion 2 which was maintained on Occasion 3. There was a strong significant interaction of treatment by occasion (Hypothesis 6.2.2.2). When positive feedback was given, the mean of perceived competence for the Positive Feedback Group significantly increased, compared to that of the Neutral Feedback Group and the differential was maintained on Occasion 3. This result was consistent with Vallerand and Reid's (1984, 1988), and Whitehead and Corbin's (1991) findings and supported Cognitive Evaluation Theory (Deci & Reid, 1980, 1985). It also supported the claim that the treatment main effect approaching significance, was the result of the interaction effect of treatment and occasion on Occasion 2 and 3. Thus, it appears that positive feedback, played an important role in increasing information about perceived competence. Weinberg, Gould and Jackson (1979), and Bandura (1989) suggested that self-efficacy beliefs, a factor very similar to perceived competence, are changed by bogus verbal feedback regardless of participants' actual performance. It is noteworthy that the level of perceived competence was maintained when verbal feedback was withdrawn on Occasion 3. Since this particular phenomenon was not examined extensively by previous research, it is difficult to explain adequately at this stage. It is suggested that Attribution Theory may be relevant here in two ways. First, a self-serving bias (Miller and Ross, 1975) might have acted to maintain self-esteem in terms of enhanced perceived competence from Occasion 2 to Occasion 3. Second, Weiner's (1972) information-processing approach would be consistent, as the information provided by performance, once positive feedback was removed on Occasion 3, confirmed that the perception of competence, for most participants in the positive feedback condition. Simply, their performance was good or better on Occasion 3 than it was on Occasion 2, so they were competent.

For intrinsic motivation, there was a significant main effect of occasion, Hypothesis 6.2.3.1 (time). The mean of intrinsic motivation increased significantly when verbal feedback was given, and then levelled off at the increased level, when verbal feedback was removed. It was assumed, in line with Cognitive Evaluation Theory, that improved performance with verbal feedback reflected an increase in perceived competence, which in turn increased intrinsic motivation. The failure to find a significant treatment effect on intrinsic motivation (Hypothesis 6.2.3.1) occurred because the random assignment to Positive Feedback Group and Neutral Feedback Group produced groups not differing in intrinsic motivation at pretest. There was, however, a significant interaction effect for occasion by treatment (Hypothesis 6.2.3.2). Positive feedback on Occasion 2, significantly and positively affected participants' intrinsic motivation. The level of intrinsic motivation was maintained in the Positive Feedback Group on Occasion 3, as was the differential between the Positive Feedback Group and Neutral Feedback Group. Positive feedback imparted feelings of competence and recognition of the activity which lead to an increase in intrinsic motivation, according to Cognitive Evaluation Theory. In contrast, neutral feedback only informed students about their performance and this had less effect on intrinsic motivation. The neutral feedback provided information but not motivation to the participants. The mean of intrinsic motivation for the Neutral Feedback Group did also show a noteworthy increase in intrinsic motivation, however, but this was not significant. The result that positive feedback increased intrinsic motivation was supported by Deci (1971), Anderson, Monogian and Reznick (1976), and Masi (1973), whose studies also found that intrinsic motivation was improved by positive feedback. Similarly, Martens, Burwitz and Newell (1972) found that positive feedback enhanced intrinsic motivation. It is possible that when positive feedback serves as an indication of their ability, students might be more motivated by this information as a reflection that they have mastered performance. It is interesting that the previously increased intrinsic motivation was maintained when verbal feedback was removed. Using existing theory and research, this is difficult to explain. It may have been because adjustment of participants' standards in the light of achievement, contributed to the participants' sense of challenge, promoting greater intrinsic motivation. Another possible explanation is that previous affective self-evaluation of their performance might have influenced positively further intrinsic motivation, as most participants improved their performance as they repeated the task. In this case, mastery information derived directly from the task, could be a dominant motivational factor, rather than information gained through verbal feedback, which was only provided on the previous occasion.

Although Year 10 students performed basketball shooting more accurately than Year 7 students, this was not a significant finding, contrary to Experiment 1, where age was significant. Thus, Hypothesis 6.2.1.1.(age) that performance of Year 10 students is significantly superior to that of Year 7 students was not supported. The mean performance of Year 7 females and Year 10 females was similar, but the mean performance of Year 7 males and Year 10 males was different. Thus, it is possible that the absence of a difference for the females groups might have reduced the chance of a significant age difference. A significant interaction effect of age by time, suggested that, when positive feedback was given, the mean of performance for Year 7 students increased more than that of Year 10 students. This results was consistent with finding of Hill and Moely (1968), using a sorting task with marbles. Kamal (1989) and Rushall and Pettinger (1969), found that the performance of the younger participants (aged 10-12 years) in swimming was influenced by the external reward more than that of the older participants (13 years of age and older). Adolescents at 12 to 13 years of age tend to be more influence by external evaluation of their performance than older adolescents. Young students in the present study might have depended more on evaluation by the experimenter in regard to their achievements, while older students have depended more on self evaluation. Perceived competence was not found to be significantly different between Year 7 and Year 10 students. Thus, hypothesis 6.2.2.1 (age) that perceived competence of Year 7 students would be significantly higher than that of Year 10 students was not supported. Year 7 males, however, had significantly higher perceived competence than Year 10 males. The perceived competence of females did not significantly vary with age. This might be due to the similarity in performance between Year 7 and Year 10 females. Bandura (1984) suggests that previous performance affects self efficacy, which is similar to perceived competence. Thus, it could be that positive feedback and greater performance improvement in males together led to greater increases in perceived competence. This will be explored further in a modelling analysis which follows in Chapter 7. Intrinsic motivation for the Year 7 students was higher than that of Year 10 students Hypothesis 6.2.3.1 (age). This result may reflect greater novelty value for younger students who had less experience in basketball free throw shooting. A three-way interaction between age, treatment and occasion suggested that intrinsic motivation for the younger students was more influenced by the positive feedback. The age difference interaction was suggested by Butler and Nisan (1986) who found that students aged 12 to 14 years were more inclined to prefer to normative comparison in response to motivate them compared with older students.

As predicted in Hypothesis 6.2.1.1 (gender), the performance of males was significantly superior to that of females through the study. This could be due to several factors including greater height and greater interest in the basketball task. Males tend to play sport more frequently and have had more previous experience and practice in similar tasks, or in basketball shooting itself. They are also likely to more goal directed attitudes than females. There was no interaction effect between gender and treatment in terms of performance. There was a significant interaction effect between occasion and gender on performance, however, this finding suggested that performance for males improved significantly between Occasion 1 and 2, and it was maintained between Occasion 1 and 3. The result for females followed the same pattern as for males, but the improvement was less marked. This might indicates that the males were more interested in the sport and possibly more achievement oriented than the females, so they tried harder and produced superior performance. The present study also found that level of perceived competence for males was significantly higher across all occasions than that of females (Hypothesis 6.2.2.1, gender). This result supports the study by Granleese, Trew and Turner (1988), who found that self-perceived competence and general perceived competence for males was significantly higher than that for females.

It was also found that intrinsic motivation for males was significantly higher than that of females (Hypothesis 6.2.3.1 gender). This difference may reflect the greater challenge and interest of basketball task for adolescent males in contrast to females. In the present study, there was a significant interaction for occasion by sex for intrinsic motivation. It was noteworthy that when positive feedback was offered, both males and females increased intrinsic motivation, although the mean for males increased more than that of females. Therefore, the difference in the effect of positive feedback on intrinsic motivation in males and females, as found by Deci (1975). was not replicated in the present study. A significant difference in the means of males and females between Occasion 1 and 3 was observed, however, but not in the context of positive feedback. This might be explained by the difference in the initial level of intrinsic motivation between genders. In addition, the influence of positive feedback on males and females was maintained in the delayed test period. Consistent with the present result Blank, Reid, and Jackson (1984), and Vallerand and Reid (1988) found that positive feedback increased intrinsic motivation in both male and female college students. Deci (1985) explained his results by arguing that traditional gender role difference might lead to a difference intrinsic motivation response by females to the positive feedback. However, Blank et al. (1984) and Vallerand and Reid (1988) suggested that females, who attended college in 1980s, were more educated to seek achievement with self-determination in the activity of daily life than females college students employed in Deci's study in the 1970s. This change might contribute to their being no difference in intrinsic motivation response to the positive feedback between gender in the more recent research. Furthermore, Blank et al. suggested that this gender difference may depend more on activities being task-gender appropriate rather than on gender role differences per se. Also, when the participants are still young, they are not equally conscious of their gender difference as are mature participants. It is also possible that the sex of the experimenter might affect the results. Whitehead and Corbin (1991) was consistent with present study that there is no gender difference on intuition motivation in response to positive verbal feedback. Hill and Stevenson (1964) found that when socially reinforced, adolescent females tended to be motivated more by an experimenter of the opposite gender, whereas under no social reinforcement, they tended to be motivated more by the same gender of experimenter. It seems more likely that, based on a combination of the sorts or factors discussed here, Deci's results were atypical and females usually respond like males to positive.feedback.

There are several important implications from this study. In the areas of sport and physical education, coaches and teachers should use positive feedback to increase performance and motivate students and performers. Neutral feedback only mentions the individuals' objective level of performance. It does not have the same power to encourage them to better their performance. Positive feedback was more effective in motivating and improving the performance of males than females, because the task used in this study seems to be of more interest for males (Mean for intrinsic motivation=53.59) than females (Mean for intrinsic motivation=49.74). Also males tend to be more interested in challenging and goal oriented activities than females. Positive feedback was more effective with young males as it is easier to motivate and encourage them by external factors, whereas older students have their own views and ideas and are not so readily influenced by external factors. In females of both age groups, the results indicated that positive feedback had a positive effect, which was not as strong, but still supports its use with adolescent females. When positive feedback was given, it tended to motivate students and increase performance. These positive effects were sustained in the longer term. Following the removal of such feedback, the positive effect was still not lost. This contradicts several previous studies where removal of extrinsic reward lead to a return of intrinsic motivation to its original lower level (Loveland & Olly, 1979). In these studies, rewards decreased intrinsic motivation which increased again on their removal. Here, rewards increased intrinsic motivation and the attribution self-serving bias would predict that in this case intrinsic motivation would retain its higher level, rather than spontaneously returning to a lower level. On the basis of this research, teachers and coaches should be concerned to employ positive feedback which leads to increases in performance or motivation in students. Positive motivational feedback is an influential variable in this respect.

In short, it is useful for some external factors like positive feedback to influence students to improve performance and to motivate them, though such feedback is more effective with 12/13 year olds than with 15/16 year old adolescents and more effective with males rather than females. As neutral feedback only refers to the degree of performance it is not as effective as positive feedback for increasing motivation and performance.

The present study should stimulate further research, as a number of issues are raised. Most previous research only focused on short periods without analysing the effect of extrinsic reward in the longer term. As time progresses the effect of the feedback tends to change and, therefore, results might be different sometime after reward is removed. Much research in the past focused only on the effect of feedback on perceived competence and intrinsic motivation and totally ignored the level of performance. The possible effect of performance on perceived competence and reciprocal effects of perceived competence and intrinsic motivation on performance, with different kinds of feedback, should be taken into account. Most studies focus only on a particular age group, for example pre school children, or college students. If appropriate age groups are compared with one another, the results may indicate developmental differences. Here, it was suggested that the effect of motivational feedback was greater with younger adolescents, probably, because they are more influenced than older adolescents by external information about their performance.

The ANOVA results of this study identified differences, but did not address the critical issue of causal relationships among feedback, performance, perceived competence and intrinsic motivation. These need to be analysed by causal modelling to clarify the causal links, especially those associated with the mediating role of performance. A structural equation modelling analysis of this data is carried out in the following chapter.

Chapter 7. Causal Modeling Analysis Using Lisrel to Examine The Effect of Verbal Feedback on Performance, Perceived Competence and Intrinsic Motivation

7.1 Introduction

Sections 5.2 and 5.3 indicated that the LISREL structural equation modelling analysis produced similar results to the multiple regression approach to path analysis. In addition, LISREL modelling permitted examination of goodness of fit of the data to the model proposed. Also, LISREL permitted parts of the full model to be examined to test specific aspects of theory or research. Because path coefficients are similar, LISREL provides additional goodness of fit information and partial model testing, it was decided to execute only a structural equation modelling analysis of the data collected in this verbal feedback study using the LISREL program. Some changes were made to the model in the effect of feedback study, based on results of the monetary rewards study. First the strong and significant path coefficients shown in the modelling analysis between testing occasions indicated that intrinsic motivation did not change over a period of two or three weeks with no experimental contact. This was also shown by non-significant ANOVA results. The measure of intrinsic motivation on Occasion 2 after two weeks break and before performance (p3) was, thus, deemed to be redundant. Similarly, perceived competence did not change significantly over the three weeks post reward delay between Occasion 2 and Occasion 3. The post delay measure of perceived competence (pc3) was, therefore, removed. Likewise, intrinsic motivation did not change over the three weeks break between Occasion 2 and Occasion 3, so the post delay measure of intrinsic motivation (im4 in the model in Figure 5.13) was omitted from the present study. As perceived competence had to be tested before reward was offered, but did not change during the three week delay, pre-reward perceived competence was tested on the pretesting occasion between performance and intrinsic motivation. This presented a third test of performance, perceived competence and intrinsic motivation relationships and a symmetrical performance, perceived competence and intrinsic motivation subscale model on each occasion. The revised model, which permitted further testing of the basic predictions of Deci's (1975) Cognitive Evaluation Theory, and Vallerand and Reid's (1983) model, but had less unnecessary, repeated testing, is presented in Fig 7.5.

7.2. Methods and Analysis

The methods employed in this study relating to subjects, measurement, treatment and procedure were presented in sections chapter 4, so they are not repeated here. The methods of analysis are now reported. The results of this study were first analysed on each occasion separately, then Occasions 1 and 2 were combined and, finally, all three occasions were examined together, giving the overall path model. The LISREL structural equational modelling results of this study are presented, as in the previous study, in a sequence which builds up from the central elements of the extrinsic reward, perceived competence and intrinsic motivation relationship on Occasion 2. Performance on Occasion 2 is then added. Next Occasion 1 is added. The performance, perceived competence and intrinsic motivation paths on Occasion 3 are then considered alone. Finally, the Occasion 3 variables are added to the full model, along with the gender and age background variables. In this study, there was no direct test of the longer term effect of extrinsic reward on perceived competence and intrinsic motivation, as these variables, that is, perceived competence (pc3) and intrinsic motivation (im4) from the first study were not measured after the two week break here. The effects of positive feedback on performance, perceived competence and intrinsic motivation in the longer term, were examined in this study by inference from the effect on Occasion 3 on performance (p3), and then perceived competence (pc3) and intrinsic motivation (im3) following it. By inference, strong and significant causal path coefficients from perceived competence (pc2) and intrinsic motivation (im2) after performance on Occasion 2 to perceived competence (pc3) and intrinsic motivation (im3) after performance on Occasion 3 respectively, would suggest the maintenance of perceived competence and intrinsic motivation over the break of two weeks.

Fig 7.1 shows the causal model derived from the model of Vallerand & Reid (1984) based on Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985). This figure shows how verbal feedback was predicted to influence perceived competence (pc2) and intrinsic motivation (im2).

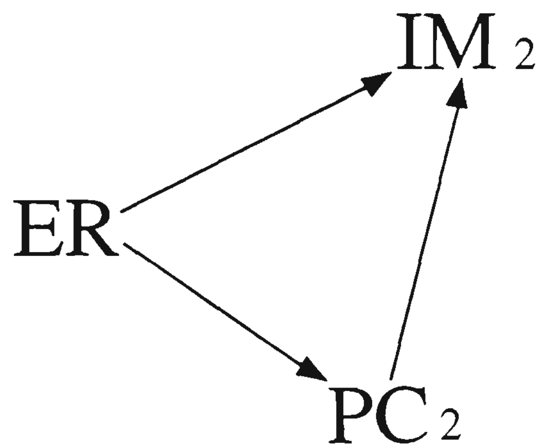


Figure 7.1 Causal model linking verbal feedback, perceived competence (pc2) and intrinsic motivation (im2) on occasion 2.

Fig 7.2 shows how it was proposed that verbal feedback affects performance (P2), which acting as a mediating variable, in turn influences perceived competence (pc2) and intrinsic motivation (im2).

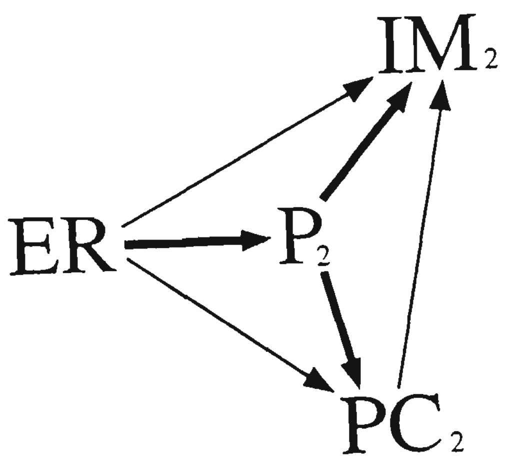


Figure 7.2 Causal model inclufing path from performance (p2) on occasion 2.

Fig. 7.3 depicts two occasions, namely the pretest and the intermediate test. The pretest as indicated on the for left side of the figure, is aimed at determining those who recored at least moderate intrinsic motivation for the task at the start. These subjects in turn participated in the intermediate test on the effect of verbal feedback on performance (p2), perceived competence (pc2), and intrinsic motivation (im2). The combined Figure shows how the results of the pretest are predicted to link with the intermediate variables.

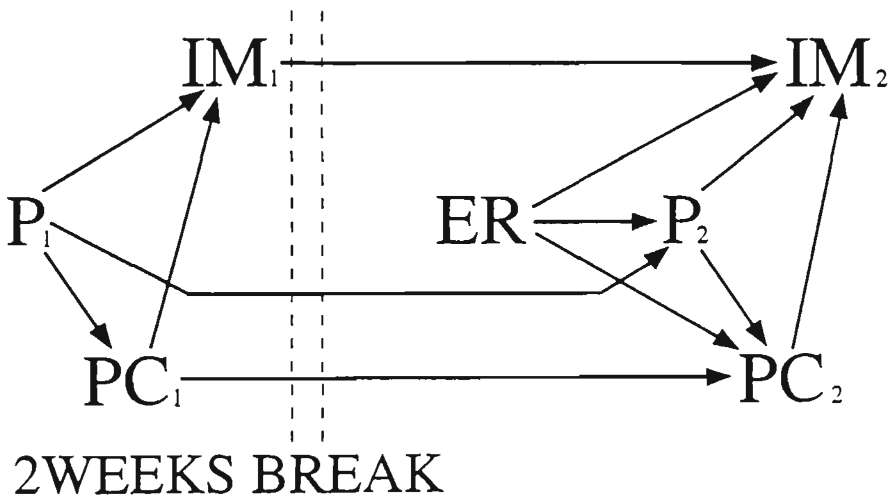


Figure 7.3 Causal model on occasion 2 including two weeks break after pretest.

Fig 7.4 shows how, two weeks after the intermediate test, a test was conducted on the effect of the withdrawal of verbal feedback on performance (p3), perceived competence (pc3) and intrinsic motivation (im3).

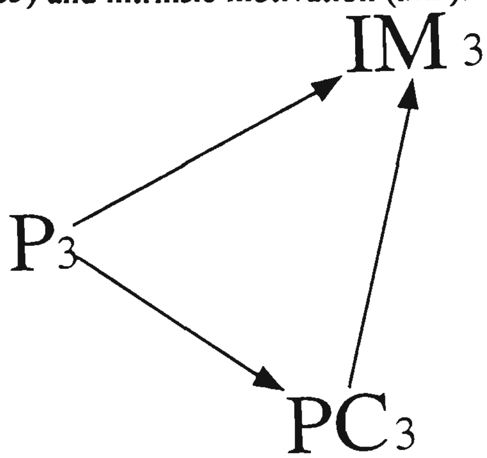


Figure 7.4 Causal model of performance (p3), perceived competence (pc3) and instrinsic motivation (im3) after three weeks break when verbal feedback is removed

Fig 7.5 combines all the models used in the entire experiment in order to determine the interrelationships of all variables, that is, the age and sex of participants, verbal feedback, performance, perceived competence, and intrinsic motivation. This model also shows the long-term effect of verbal feedback on each variable, as well as the result of removing verbal feedback during the experiment.

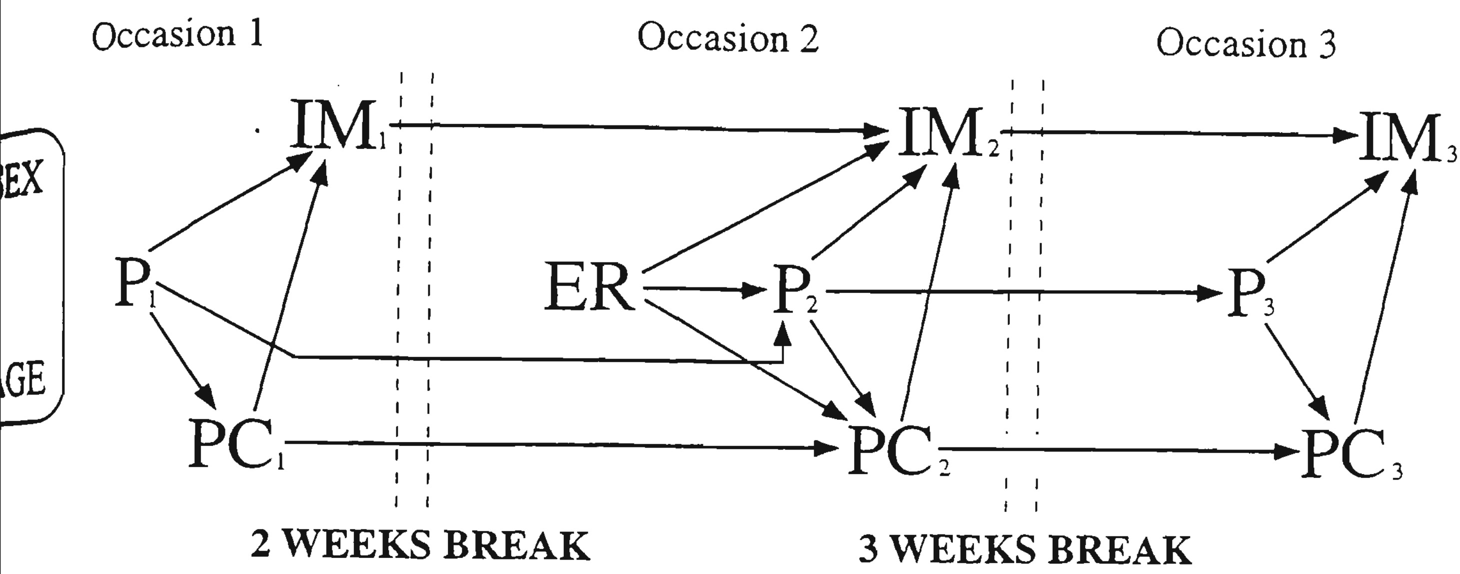


Figure 7.5 Causal model of predicted relationship between verbal feedback, performance, perceived competence and intrinsic motivation with age and gender for overall model.

7.3 Results

7.3.1 Causal Paths

Each figure shows the t-stastistic, which is derived from the path co-efficient divided by an estimate of the asymptotic standard deviation of the path co-efficient. For large samples, this t-statistic, which perhaps should be more appropriately labelled as a z-statstic, is approximately normally distributed with a mean of 0 and standard deviation of 1 (Lorg, 1978). Hence, path co-efficients with t-values greater than 1.97 in absolute value would be regarded as significant at the 5% level, regardness of sign. In order to use verbal feedback as a predictor, for age, gender and feedback, "dummy" coding procedures were used as in Vallerand and Reid (1984) who followed Kerlinger and Pedhazur (1973). For gender, males were coded as 1 and females were coded as 2. For age, Year 7 students were coded as 1 and Year 10 student were coded as 2. Finally, for treatment, the positive feedback group was coded 1 and the neutral feedback group was coded as 2.

Figure 7.6. presents the path model linking extrinsic reward, perceived competence (pc2) and intrinsic motivation (im2). The results showed that verbal feedback did not have a significant effect on intrinsic motivation (im2) (path coefficient =.119, t=-1.954), but the t-value approached significance. Extrinsic reward had no significant effect on perceived competence (pc2) (path coefficient =.153, t =1.571), however, perceived competence (pc2) had a significant effect on intrinsic motivation (im2) (path coefficient = .204, t=2.658). This result indicated that perceived competence (pc2) has a greater effect on intrinsic motivation than did verbal feedback.

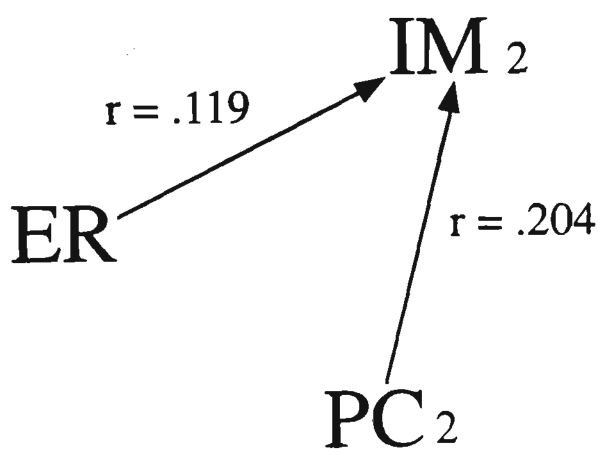


Figure 7.6 The result of causal model linking verbal feedback, perceived competence (pc2) and intrinsic motivation (im2) on occasion 2.

Fig 7.7 presents the effect of extrinsic reward on performance, perceived competence and intrinsic motivation and the effect of performance on intrinsic motivation (im2) and perceived competence (pc2). Verbal feedback did not have a significant effect on performance (p2). Performance (p2) had a significant influence on perceived competence (pc2) (path=.569, t=4.47) and intrinsic motivation (im2) (path=.396, t=8.37). However, feedback did not directly influence perceived competence (pc 2) (path=.085, t=1.299) or intrinsic motivation (im2) (path=.105, t=1.469). Also, perceived competence did not mediate between performance and intrinsic motivation when performance was included in the model (path=-0.013, t=.152). When basketball performance was not included, there was a significant path coefficient between perceived competence and intrinsic motivation as shown in Fig 7.7. However, when basketball performance was included the path coefficient between perceived competence and intrinsic motivation was very close to zero and not significant. One possible explanation is that the significance was an artifact, related to not including the basketball performance information in the model.

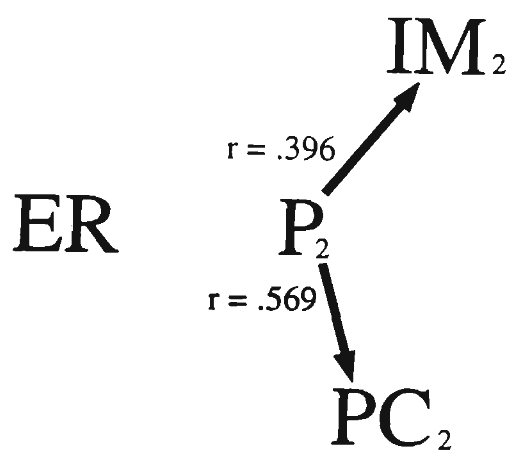


Figure 7.7 The result of causal model including path from performance (p2) on occasion 2.

The path model in Fig 7.8 shows the result of combining the performance (p1), perceived competence (pc1), and intrinsic motivation (im1) paths on the first occasion with the model. This presents the effect of performance on perceived competence (pc2) and intrinsic motivation (im2) on the pretest two weeks before the treatment occasion. The results indicate that performance (p1) on Occasion 1 had a significant effect on both perceived competence (pc1) (path=.603, t=9.075) and intrinsic motivation (im1) (path=.434, t=4.702). Also, intrinsic motivation on Occasion 1 (im1) had a significant effect (path=.919, t=35.154) on intrinsic motivation (im2) on Occasion 2. Performance (p1) on Occasion 1 had a significant effect on performance on Occasion 2 (p2) (path=.952, t=43.161) and perceived competence on Occasion 1 (pc1) had a significant effect on perceived competence on Occasion 2 (pc2) (path=.765, t=15.027). However, the effect of verbal feedback on performance (p2) was still significant (path=-.120, t=.5808), while those for verbal feedback on perceived competence (pc2) (path=-.170, t=4.009) and on intrinsic motivation (im2) (path=.123, t=5.054) attained significance previously not observed. Negative path coefficant arise simply because positive feedback was dummy coded 1, with netural feedback coded 2. The effect of performance (p2) on perceived competence (pc2) (path=.108, t=2.053) was also significant. Similarly, Figure 5 and 6 explain why the t value for the path coefficient between p2 and im2 decrease from 8.38 to 0.484 when it went from Figure 7.8 to Figure 7.9. the correlation between p2 and im2 (t=0.4002) is not significant, the partial correlation between p2 and im2 adjusted for treatment and im1 (t=0.261) is not significant. In other words p2 gives no extra information about im2, given the information about im2 already contained in treatment and intrinsic motivation 1. See Figure5. One of the reasons for the spurious correlation given in Figure 7.8 is the correlation between intrinsic motivation (im1) and performance (p2) as shown in Figure 6.

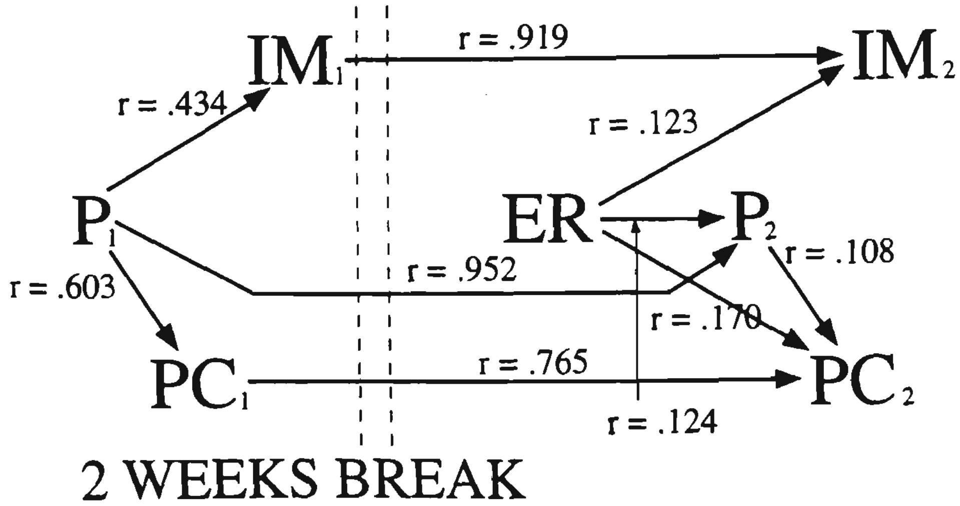


Figure 7.8 The result of causal model on occasion 2 including two weeks break after pretest.

Fig 7.9 shows the effect of performance (p3) on perceived competence (pc3) and intrinsic motivation (im3), with positive feedback removed after a three week break following the extrinsic reward period. Performance (p3) had a significant direct influence on perceived competence (pc3) (path=.442, t=6.361) and intrinsic motivation (im3) (path=.309, t=3.681). However the mediating effect of perceived competence (pc3) between performance (p3) and intrinsic motivation (im3) was not significant. It appears therefore, that performance may have imparted information linked directly to the changes in perceived competence (pc3) and intrinsic motivation (im3), this is, perception of competence increased because students saw that they were performing better, and intrinsic motivation increased because of some aspect of performance, not because of the change in perceived competence.

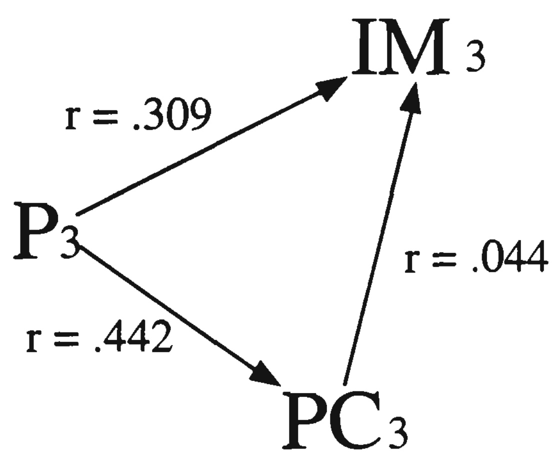


Figure 7.9 The result of causal model of performance (p3), perceived competence (pc3) and intrinsic motivation (im3) after three weeks break when verbal feedback is removed.

The results of the overall path model are presented in Figure 7.10. Results clearly indicate that previous performance (p1), perceived competence (pc1), and intrinsic motivation (im1) significantly influenced each subsequent value of the same variable. In addition, verbal feedback significantly influenced performance (p2) (path=-.124, t=5.508), perceived competence (pc2), (path=.170, t=4.008) and intrinsic motivation (im2) (path=-1.23, t=5.094). The effects of extrinsic reward were significant in Figure 7.4 but not significant in Figure 7.3. To explain this, consider the path between extrinsic reward (er) and intrinsic motivation (im2). Figure A (Figure a.b.c.d. Appendix) shows a plot of im2 versus the treatment groups. There is no significant difference between the group averages, particularly because of the large variability, and this is in agreement with the path co-efficient being not significant in Figure 7.3. Figure B shows a plot of IM1 and IM2. As expected, they are clearly related. Figure C shows the plot of the residual from the relationship shown in Figure B and the treatment group. The much smaller variability allows the difference to now show up as significant. A similar picture emerges from the examination of figure D. Both Figures C and D are in agreement with the path coefficient being significant in Figure 7.4. Note that the path co-efficients, unlike the t-statitics, do not change much, on going from Figure 7.3 to Figure 7.4, because in the experiment the subjects were randomised into the two treatment groups.

Performance on Occasion 2 (p2) had a significant influence on perceived competence on Occasion 2 (pc2) (path=.108, t=2.053). Age and gender also had significant effects on various variables in the present study, for example, the level of performance on Occasion 1 (p1) (path=.204, t=2.614) and performance on Occasion 3 (p3) path=.101, t=3.187) were significantly influenced by gender.

Likewise, the level of perceived competence on Occasion 3 (pc3, path=-.037, t=2.128) was influenced considerably by gender. In like manner, age affected intrinsic motivation on Occasion 1 (im1) (path=.241, t=3.272) and intrinsic motivation on Occasion 3 (im3) (path=.048, t=2.471).

7.3.1. Goodness of Fit.

Table 7.1 shows the results of a goodness of fit analysis of this data to the model. The p value of the chi-square statistic is less than 0.05, suggesting that there is not a strong fit, although as explained previously, Joreskog suggests that the value should not be used purely as a significance test. The value of the chi-square ratio to the degrees of freedom is 3.0, which is classed as acceptable by some authors (Saris & Strongkhorst, 1981). The value of the Goodness of Fit Index is .924, which is acceptably high and the Root Mean Square Residual of 0.031 is acceptably low. However, the value of the Adjusted Goodness of Fit Index (.779) is not as high as would be expected to indicate a very strong fit, but is moderate, not reflecting abscence of fit either.

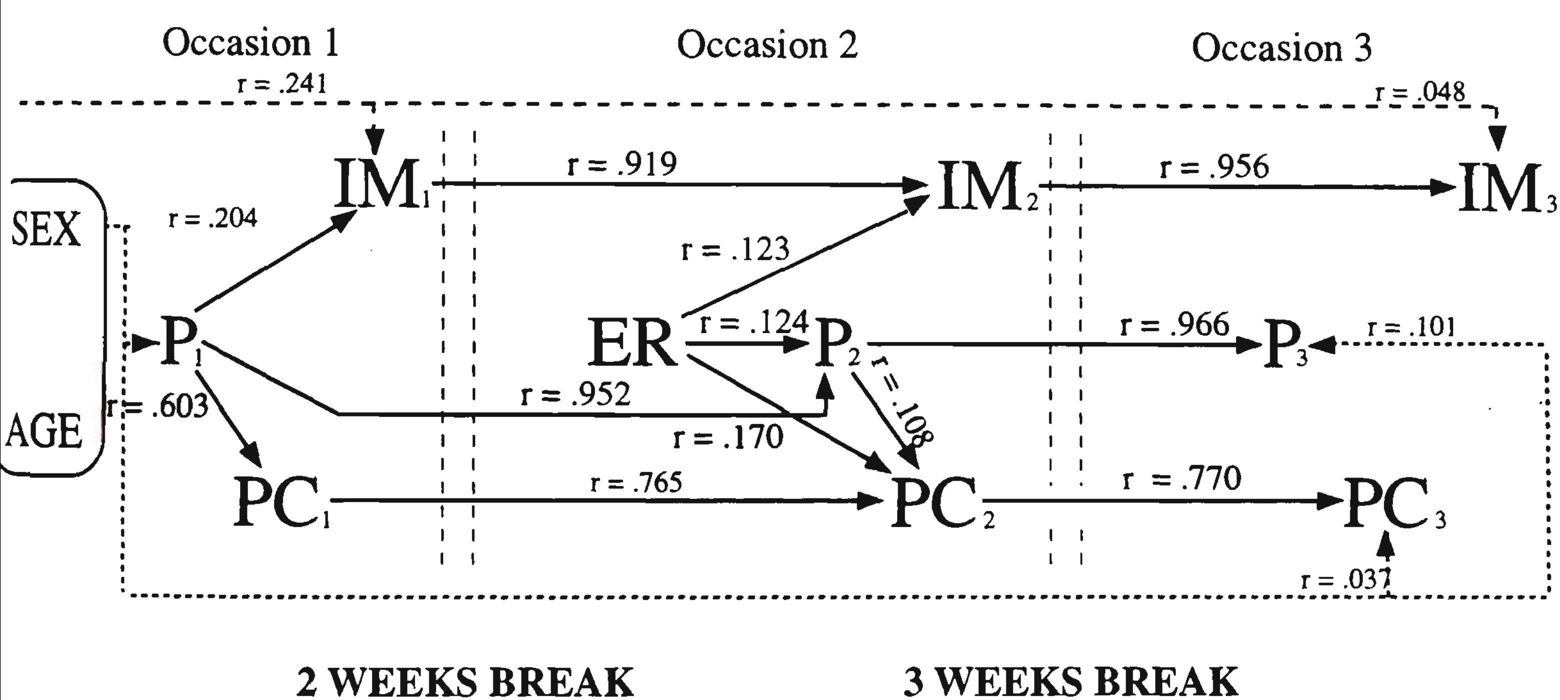


Figure 7.10 The result of causal model of predicted relationship between verbal feedback, performance, perceived competence and intrinsic motivation with the age and gender for overall model.

The significant chi-square value suggests that the data was not a close fit to the model. However, Joreskog and Sorbom (1981) suggested that due to the many parameters evaluated in the analysis, the data might become significantly different when applied to large samples. Thus, the analysis is often not clarified by a literal interpretation of chi-square. The result of the chi-square to degrees of freedom ratio (3.0) is considered acceptable in the data to the model because Weiss, Bredemeier and Schewchuk (1985) suggested that a value of less than 5.0 should be considered to be acceptable.

Table 7.1.

Result of Goodness of Fit Analyses for the Whole Model.

Chi-square Statistic	81.01 $p<0.001$
Degrees of Freedom	27
Goodness of Fit Index (GFI)	.924
Adjusted Goodness of Fit Index (AGFI)	.779
Root Mean Square Residual (RMSR)	.031

Generally speaking, the Goodness of Fit Index value, the Adjusted Goodness of Fit value and the value of RMSR in the present study seem to be adequate.

7.4. Discussion

The results of the present study showed that previous performance information has a significant influence on subsequent performance across three occasions. Perceived competence and intrinsic motivation also followed the same pattern across the three occasions. Path coefficients for all three variables from occasion to occasion were very strong, as might be expected. Positive verbal feedback significantly influenced performance on all three occasions. The present study showed that the effect of verbal feedback significantly and directly influenced performance, perceived competence and intrinsic motivation. Moreover, performance significantly influenced perceived competence directly in the overall model. It appears that an increase in performance occurred as a result of verbal feedback because the positive feedback, as an informational factor, enhanced performance more than netural feedback, which simply provided performance information. The improved performance could be a mediating factor associated with the increase in intrinsic motivation, in which case the motivational consequence of doing better has a major role (Bandura, 1988). Vallerand and Blais (1986) proposed that performance influences the level of perceived competence, which in turn affects intrinsic motivation. They termed this a Cognition-Affect-Intrinsic Motivation model which they applied to basketball competition. Deci and Ryan (1988) also suggested that performance can mediate between extrinsic reward and intrinsic motivation by using the term performance-mediated effect, suggesting reward could affect one's performance of the task, and this effect could in turn, influence the level of intrinsic motivation. The present study supported Cognitive Evaluation Theory and the Cognition-Affect-Intrinsic Motivation model. The level of performance significantly influenced perceived competence and intrinsic motivation in both cases, that is, when a reward was present and when the reward was removed. One interpretation is that the subjects' perception of their level of performance can have a direct effect on their intrinsic motivation.

Vallerand and Reid (1984, 1988) and Whitehead and Corbin (1991) in research, using verbal feedback as the extrinsic reward, which they analysed using path analysis, found that perceived competence had a mediating effect between positve feedback and intrinsic motivation. That is, verbal feedback enhanced perceived competence, which in turn increased intrinsic motivation. This finding has been supported in part in the present study. That is, it became manifest in the separate models, but not in the combination of all the models. In the separate models, perceived competence had a stronger effect on intrinsic motivation than did verbal feedback. In the overall model, however, perceived competence did not seem to affect intrinsic motivation greatly. The result of LISREL analysis tallied with the findings of the ANOVA analysis that positive feedback significantly increased the subject's performance, perceived competence and intrinsic motivation.

The present study proposed that performance plays a mediating role in the extrinsic reward, perceived competence and intrinsic motivation relationships of Cognitive Evaluation Theory. The results supported this proposal, indicating that performance influenced following perceived competence and intrinsic motivation on all three occasions. Its influence was stronger on Occasion 1 and Occasion 3, when no reward was offered, but it was still present on Occasion 2 when extrinsic reward also exerted a strong influence. While this partially supports the finding of Vallerand and Blais (1986), the absence of a consistent causal link between perceived competence and intrinsic motivation and the presence of a strong link directly from performance to intrinsic motivation was contrary to their results. It appears that, in some way, performance directly influenced intrinsic motivation. Within a Cognitive Evaluation Theory framework, it might be argued that seeing performance increase as a consequence of their efforts, made subjects feel more self-determining which enhanced intrinsic motivation. Alternative possibilities, such as subjects' perceiving themselves as meeting the challenge, or increased interest or enhanced enjoyment as a result of doing the task well, might also explain this direct relationship.

In terms of the overall model, intrinsic motivation on Occasion 1 (im1) influenced intrinsic motivation on Occasion 2 (im2) which in turn influenced intrinsic motivation on Occasion 3 (im3). Performance and perceived competence followed the same pattern on Occasions 1, 2 and 3. Also, verbal feedback significantly influenced performance, perceived competence and intrinsic motivation on Occasion 2. In the intermediate test, however, performance significantly influenced only perceived competence. In the absence of feedback, on Occasion 1 and 3 performance had a highly significan influence on perceived competence and a significant effect on intrinsic motivation.

It is, however, difficult to explain why perceived competence did not influence intrinsic motivation in the overall model. This result is not consistent with the previous studies by Vallerand and Reid (1984, 1988), and Whitehead and Corbin (1991). It may be that the nature of the subjects and the task in each study affected the results. Vallerand and his collegues (1984, 1988) used physical education students as subjects and the stabilometer as the task. In terms of subjects, physical education students are more experienced in physical activity generally and more familiar with the specific stabilometer task. Therefore, the subjects might have been more able to evaluate their performance, which affected perceived competence notably. However, the present study focused on secondary school students who were not as knowledgeable as the physical education students in performing the task, in this case basketball free throw shooting. They were also less able to compare their performance with that of other subjects because variation in performance was very large in this group, some subjects played regular basketball, while others played it for the first time in the study and each subject was tested alone, so there was no chance for comparison with others during the study. However, Whitehead and Corbin (1991), Woodcock and Corbin (1992) results were inconsistent with the result of this study, because it may be different subscales, that is both these studies, Whitehead and Corbin (1991) and Woodcock and Corbin (1992) included press and tension subscales, whereas the present study discluded this subscale. These two studies under discussion used a different analysis method from the present thesis. They used a partial correlation with perceived competence relation to each IMI subscale and without performance value. In contrast the present study used path analysis with perceived competence relating to the overall IMI value with performance value.

A main objective of the present analysis was to evaluate the fit of the model to the data. LISREL suggested a number of measures of fit as a whole, namely Chi Square, with its degrees of freedom, called the Chi Square Ratio, the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), and the Root Mean Square

Residual (RMSR). According to Byrne (1989), a chi square ratio greater than 2.0 is an inadequate fit. In the present study, the value of a Chi Square Ratio was 3.0, indicating that based on that criterion it is a poor fit. A Chi Square Ratio of five times the degrees of freedom is reasonable according to Wheaton (1977). However, Carrines and Molver (1981) were of the view that two or three times is more acceptable. The criteria for judging the model fit given by Byrne (1989), Wheaton (1977) and Carrines and Molver (1981) lead to different conclusions in the present analysis. As such, a universally acceptable Chi Square Ratio has not been arrived at which can produce consistent, widely agreed upon results. Joreskog and Sorbom (1986) were of the view that it is incorrect to say whether it is a good or poor fit, rather it would be appropriate to say whether the model is tenable or not.

The interpreation of the Chi-Square Ratio appears to depend on the statistical leaning of the specific experimenter. It appears that the criteria for the Goodness of Fit Index depend on whether the sample size is large or small. Therefore, the value of the Goodness of Fit Index should be interpreted as acceptable or not, depending on the sample size. Taking into account all the above factors, a chi square ratio of 3.0 in the present study sounds quite acceptable and reasonable. According to Byrne (1989), a GFI of appromixately .9 is a fairly good fit. In this present model the Goodness of Fit Index was .924, indicating that it is fairly good. When degrees of freedom is taken into account as in the present study, the AGFI value is .779, indicating that it is a fair fit only as values quite close to 1.0 are considered to reflect good fit. A Root Mean Square Residual close to zero is considered good and in the present study as the RMSR is .031, it is considered to be acceptable. Byrne (1989) suggested, however, that it is incorrect to depend solely in this single statistic in determining the model fit as even wrong models may have an RMSR close to zero. A definitive conclusion on the fit of the present data to the proposed model cannot be unequivocally stated. While it is a acceptable by most indicators the fit is clearly not as close as would be needed to have great confidence that the model is the best explanation of the relationships under study here. Of particular concern in this respect is the weak to non-significant path between perceived competence and intrinsic motivation. This path could be attenuated by the very strong links between the same variable on consecutive occasions found for performance, perceived competence and intrinsic motivation. This would not explain the significant paths found for performance on some of these occasions, however, consistent with, but enhancing the ANOVA findings.

In conclusion, LISREL causal modelling analysis for the present study suggested that positive verbal feedback had a significant positive effect on basketball free throw shooting performance, perceived competence and intrinsic motivation both immediately, in the long term, and when the reward was withdrawn.. The thought of breaking of a previous record contributes greatly to the drive to perform better. It is possible that the learning effect may contribute to present results, because once a `sports skill is acquired, it may not easily disappear. Thus, performance was maintained after removing the reward on Occasion 3 and it influenced perceived competence and intrinsic motivation. Performance had a significant effect on perceived competence in the present study; this is consistent with the study of Vallerand and Blais (1986). It is noteworthy that even when verbal feedback was removed, performance still had a significant effect on perceived competence and intrinsic motivation when the component models were evaluated separately. It appears that positive verbal feedback could contribute to performance, perceived competence, and intrinsic motivation both in the long term and when the reward was removed. When the present result was analysed separately from the overall model, for the relationship between verbal feedback, perceived competence, and intrinsic motivation, the mediating effect of perceived competence on intrinsic motivation was found to be significant. In all other models it was not significant condition. This suggests that the effect of perceived competence on in intrinsic motivation was not as strong as the direct effect of positive feedback or the effect of positive feedback mediated by performance. This implications of all the finding are discussed in the following section.

7.5. Overall Conclusion Regarding Study 2

The results of the ANOVA and LISREL analysis suggested that positive verbal feedback (normative praise) significantly and positively influenced performance, perceived competence and intrinsic motivation. Furthermore, this level was maintained after verbal feedback was removed. For each variable the interaction effect between treatment and occasion was significant ($p<0.05$), suggesting when positive feedback was provided, each variable was significantly increased.

Each variable for the younger students was more influenced by positive feedback than that of older students. Different age groups did not exhibit significantly different response in performance, perceived competence, indicating performance and perceived competence are likely to be influenced by psychological development and skill progress rather than the age effect. In particular, there was no gender difference in intrinsic motivation in response to positive feedback. Intrinsic motivation was increased both for males and females. This contrasts with previous study (Deci, 1972) which found a gender difference in intrinsic motivation and positive feedback.

The results of LISREL supported the results of ANOVA, suggesting that positive feedback (normative praise) was significantly associated performance, perceived competence and intrinsic motivation. The results of LISREL indicated that each previous variable has a significant influence on the following variable across the three Occasions. The performance had a significant effect directly on perceived competence when a reward was given in the overall model. However, when data was analysed by separating second occasion and third occasion of the model, the performance had a significant effect directly on perceived competence and intrinsic motivation both in the reward and removal of reward period.

In general, the mediating effect of perceived competence on intrinsic motivation was barely evident in the overall model. However, this effect was analysed independently on the second occasion and the data was analysed a relationships between verbal feedback, perceived competence and intrinsic motivation became only apparent. The results of this data fit to the overall model regarding the chi-square ratio (3.00, Goodness of Fit Index (.924), Root Mean Square Residual (.031), Adjusted Goodness of Fit Index (.779), suggested that the data fit to the overall model appeared to be quite acceptable and reasonable.

Chapter.8. Confirmatory Factor Analysis

8. 1. Introduction

In Chapter 3, the internal consistency of the Intrinsic Motivation Inventory (IMI) was determined for use with 12 -16 year old Australian students. McAuley, Ducan, and Tammen (1989) had modified it to a 16 item version with four subscales, for use in sport (basketball one-on-one game) with American college students. At the time when the thesis was developed, that is during 1990, this McAuley et al. paper strongly supported the factor structure of the IMI. In fact, in a later paper (McAuley, Wraith, & Duncan, 1991) further factor analytic data is cited in support of this factor structure. In this context, the present thesis accepted the claim that a very robust four factor structure existed. Before using the IMI in the present research it was, thus, considered to be necessary only to check the internal consistency of the subscales for use with Australian adolescents. Presentation of preliminary results of the main studies in 1993, first raised comments that the IMI might have weak factorial validity. It was decided at this point that it would add information to the present thesis if a confirmatory factor analysis was done on the final set of internal consistency data, even though it could not affect the main studies which had already been completed.

Four studies were required to modify the IMI for Australian use. Although the results of the fourth study suggested that the 11 item version of the IMI developed for use with the younger Australian sample had an acceptable level of internal consistency, the internal consistency analysis does not provide confirmatory evidence for the factor structure of the IMI. A confirmatory factor analysis was, therefore, executed to examine the factor structure of the 11 item IMI, using the data from the fourth internal consistency study, which produced acceptable internal consistency, with an overall alpha coefficient at 0.90 and subscale alpha coefficients with the following levels: Effort-Importance, alpha=0.73, Interest-Enjoyment, alpha=0.81, Perceived Competence, alpha=0.89.

Weiss, Bredemeier and Shewchuk (1985) used a confirmatory factor analysis to test the fit to sport data of the model for the intrinsic motivation questionnaire which was developed by Harter (1981b). Weiss et al. used as subjects third to sixth grade students, participating in a children's summer sport camp, which was organised to focus on skill development, cooperation with a co-worker and positive attitude toward sports. The chi square value for the study by Weiss et al. was 565 with 385 degrees of freedom using the LISREL 5 program. Although this chi-square value was significant, the ratio of the chi square value to the degrees of freedom is 1.43, and since this is less than 2, according to Byrne (1989), it indicates an acceptable fit. Additionally, the Goodness-of-Fit-Index (GFI) of .749 and the Adjusted Goodness-of-Fit Index (AGFI), .705, led to an acceptable fit of the data to the whole model. They did not report the value of Root Mean Square Root.

Markland, Hardy and Ingledew (1992) suggested that the results of the confirmatory factor analysis of IMI employed in competitive basketball game McAuley et al. (1989) was liberally interpreted according to conventional conception. For example, they reported that the fit of data to proposed structure of IMI was a good fit. Markland et al. pointed out that the chi-square ratio was 2.499, which according to Byrne (1989) is poor fit, being more than 2.0. The value (0.057) of Root Mean Square Root (RMSR) was higher than close to zero, which is not very good fit. They did not report the value of the Adjusted Goodness fit Index.

McAuley, Duncan and Tammen (1989) used confirmatory factor analysis to determine the fit to the hypothetical factor structure for the 18 and 16 item versions of the Intrinsic Motivation Inventory (Ryan, 1982) in a competitive basketball one-on-one game with college students. They used the LISREL 6 program to test a hierarchical model of the IMI (Ryan, 1982) in which four first order factors (Interest-Enjoyment, Perceived Competence, Effort-Important and Pressure-Tension) loaded on a second order factor (Intrinsic Motivation). For the 18 item version, they found that chi-square=252.36, degrees of freedom=101; the ratio between the chi-square and its degrees of freedom was 2.499; GFI=.788; RMSR=.136; delta=.76. (p.<.001). McAuley et al. (1989) found no change in the factor structure when two items were deleted which increased the internal consistency of subscales. They supported this 16 item version of the IMI.

Markland, Hardy and Ingledew (1992) investigated the factorial validity of the Intrinsic Motivation Inventory (IMI) developed by Ryan (1982), using a 15 item version with three items representing a perceived choice scale (Markland, 1991). The subjects in this study were people aged 21 years participating in regular physical exercise. The result of confirmatory factor analysis employing LISREL 7 revealed that the hierarchical model with the original perceived choice scale, suggested a poor fit to the data (chi square=356.47, p<0.001; the quire squre ratio value =2.74; Adjusted Goodness of Fit Index=0.771; RMSR=0.147). Markland et al. (1992) proposed that the rational factors based on the theoretical background to the IMI needed substantial revision due to some possible weaknesses. For instance, some of the items may not reflect the conception of intrinsic motivation proposed to underlie the IMI. Thus, the items in the perceived competence scale, appear to refer to a social comparison conception of perceived competence rather than perceived competence judged internally. The pressure-tension and effort scales were also questionable, according to Markland et al., because an individual may feel under pressure and tense in a competition and still be highly motivated intrinsically. The effort scale can also be questioned because great effort does not necessarily reflect intrinsic motivation, because the person might truly be more interested in the external reward.

Taken together, the value of chi-square ratio in two separate studies by McAuley et al.(1989) and Markland et al.(1992) indicated that the fit of the data to the proposed structure of IMI was a poor fit. A variety of acceptable values for the ratio between the chi-square and its degrees of freedom have been recommended, ranging from a low of 1.50 with sample size of 1000 (Muther, 1987) to a high level of less than 5.00 (Hendricson, 1983). Saris and Stronkhorst (1981) have also proposed that a ratio of chi-square to degrees of freedom below a value of 5.0 is considered to be an index of the model's acceptability. Byrne (1989) recommended that a ratio of greater than 2.0 is a poor fit. Although the chi-square value is clearly noteworthy and would normally indicate lack of fit, Joreskog (1977) suggests that

> "Although the chi-square-measure may be viewed theoretically as a test statistic for testing the hypothesis that is of the form implied by the model against the alternative that is unconstrained (see Joreskog, 1977), it should be emphasised a use of chi-square is not valid in most applications. In most empirical work, the model is only tentative and is only regarded as an approximation to reality. From this point of view the statistical problem is not one of testing a given hypothesis (which a priori may be considered false), rather one of fitting the model to the data and to decide whether the fit is adequate or not (p 47)".

To explain this, Joreskog notes that

> "the chi square is sensitive to sample size and very sensitive to departures from multivariate normality of the observed variables. Large sample size and departures from normality tend to increase chi square over and above what can be expected due to specification error in the model (p. 43)"

In addition, researchers have used the Goodness-of-Fit Index (GFI) and the Root Mean Square Residual (RMSR) to show the overall fit of the data to the model, but similar discussions about the degree to which values reflect a good fit have also plagued the literature here.

Although the sample (N=80) was rather small, it was determined to execute a confirmatory factor analysis on the data from the fourth internal consistency study in the present thesis (that which used the version of the IMI later used in the two main studies) to test the goodness of fit of the data to the proposed structure of the modified IMI of three first order factors (Perceived Competence, Interest/Enjoyment, and Effort/Importance) and one second order factor intrinsic motivation. This was considered to be appropriate in view of contemporary practice (e.g. McAuley et al., 1991; Weiss et al., 1985) and methodological advice such as that of Schutz (1993) in his keynote address on methodology in sport psychology at the World Congress of Sport Psychology.

8.2. Method and Analysis

8.2.1. Participants, Design, Measures, Procedure

The details of all aspects of the method of data collection for this analytical procedure are presented in Chapter 3 in section 3. This includes the nature of the sample, the specific wording of the 11 IMI items and the testing procedure which was followed.

8.2.2. Nature of the Analysis.

The basic idea of factor analysis is to find a small set of underlying latent variables that account for the intercorrelation between the response variables, in this case the items of the questionnaire. In contrast to an exploratory factor analysis, in confirmatory factor analysis the underlying model is based on a specified hypothesis. The observed variance-covariance matrix can then be checked against a fitted value given the model and the data. Various fit indices can be constructed based on the discrepencies between the observed and predicted variances and covariances, and these can be tested statistically to see if the model does or does not agree with the data.

The LISREL 7 Package (Joreskog & Sorbom, 1989) provides a very convenient method for doing the calculations. Another package, PRELIS (Joreskog &. Sorbom, 1990) is a preprocessor for LISREL and provides the necessary estimation of the correlation matrix, particularly in troublesome situations when some of the data is ordinal or censored, that is, only part of the distribution is observable.

For ordinal data the preferred procedure is to use polychoric correlations rather than Pearson correlations, and to use a weighted least squares analysis based on an estimate of the asymptotic variance-covariance matrix of the correlations. The PRELIS program will not compute the variance-covariance matrix unless the sample size is bigger than 200. According to the manual this can be done but "this possibly should be used with very careful attention, because results produced in small samples may not be reliable"(Joreskog & Sorbom, 1989). Hence, all analyses in this study which used a sample of 80 subjects are based on Pearson's correlations. It should be noted that it appears that while McAuley, Duncan and Tammen (1989) based their analyses on Pearson's correlations, Markland et al. (1992) based their analyses on covariance matrices.

The raw data from the fourth internal consistency study is presented in Appendix 7. A confirmatory factor analysis was executed using the appropriate facility in the LISREL version 7 program.

Figure 8 1: Null model (M0) with no underlying structure (i.e. caus (X1, X2) = 0.)

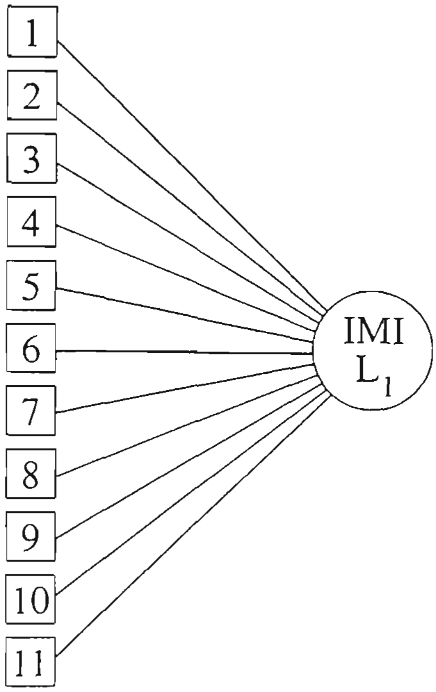


Figure 8 .2 First order model (M1) with one latent variable (L1).

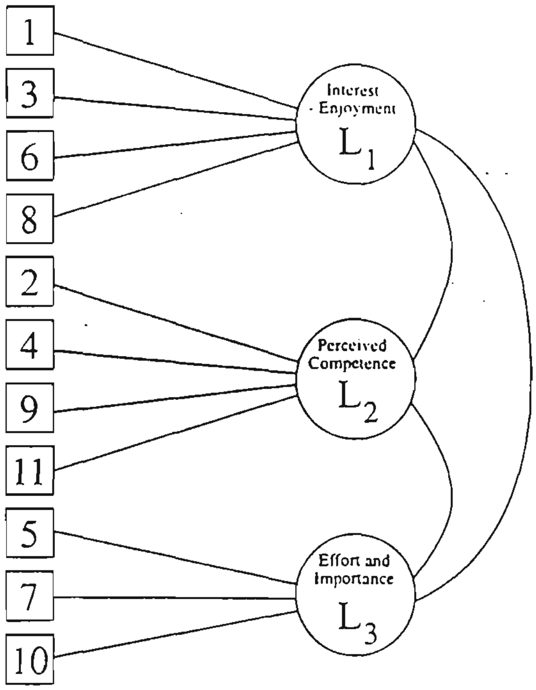


Figure .8.3 First order model (M3) with three latent variables (L1, L2, L3).

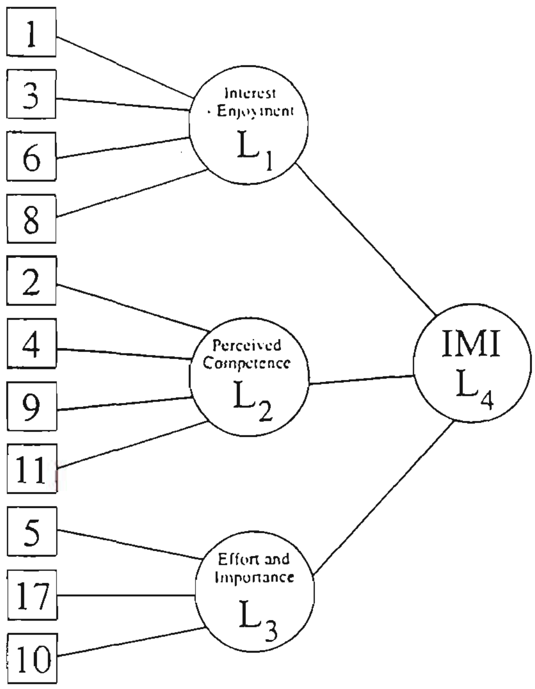


Figure 8.4: Second order model (M4) with three first order latent variables (L1, L2, L3) and one second order factor variable.

Fig 8.1 Null Model (M_0) With No Underlying Structure (ie, caus (X1, X2)=0.

Fig 8.2 First Order Model (M_1) With One Latent Variable (L1).

Fig 8.3 First Order Model (M_3) With Three Latent Variables (L1, L2, L3)

Fig 8.4 Second Order Model (M_4) With Three First Order Latent Variables (L1, L2, L3) and one Second Order Factor Variable.

The null model shown in Figure 8.1 makes no attempt to model the correlations between the items in the IMI. This is because each item is independent and not in any way related to the other. The first order model in Figure 8.2 attempts to explain the correlation between the items in the IMI by the existence of one latent variable, the correlation between each variable and the underlying IMI factor. The first order model in Figure 8.3 attempts to explain the correlations between the items in the IMI as due to the existence of three latent variables corresponding to the three sub-scales. Each item loaded each of the subscale factor(three), which are compared and inter-related to each other. The three latent variables are correlated. Finally, the model shown in Figure 8.4 attempts to explain the correlations between the three latent variables introduced in Figure 8.3 by the existence of an additional latent variable. In order to test a hierarchical version of IMI, the 11 items were grouped into three subscales, from the relationships of which the IMI was determined.

When there are only three first order latent variables the two models presented in Figure 8.3 and 8.4 generate the same covariance matrix and hence cannot be separated on the basis of the data. Statiststically, the two models are equivalent. With only three subscales it would be impossible to separate the first order and second order models on the basis of the data. The confirmatory factor analysis, thus, tested the three factor model, Model 1 in Figure 8.1.

8.3. Results

The results of the confirmatory analysis are presented in Table 8.1. Four models were fitted;

a) M_0 the null model, shown in Fig 8.1.

b) M_1 all individual items loading on a single latent variable, intrinsic motivation shown in Fig 8.1.

c) M_3, items 1, 3, 6 and 8 loading on an Interest and Enjoyment latent variable, items 2, 4, 9 and 11 loading on a Perceived Competence latent variable, and items 5, 7 and 10 loading on an Effort/Importannce latent variable.

d) M4, as for M3 but in addition the latent variables Interest/Enjoyment, Perceived Competence and /Effort and Importance loading on a second-order latent variable intrinsic motivation.

Table 8.1 gives various summary statistics for each model; these are the Chi Square goodness of fit test, the associated degrees of freedom, the Goodness of Fit Index, the Adjusted Goodness Fit Index and the Root Mean Square Residual.

Table 8.1.

Goodness of Fit Indices For IMI For Basketball Free Throw Shooting (N=80)

Model	χ^2 Fit Test	*df*	χ^2 Ratio $= \frac{\chi^2}{df}$	GF	ADJ GF	RSMR
M_0	565.43	55	10.28	0.381	0.257	0.368
M_1	253.61	44	5.763	0.621	0.431	0.152
M_3	184.99	41	4.511	0.716	0.543	0.120
M_4	184.99	41	4.511	0.716	0.543	0.120

Examination of the summary statistics reveals both M_0 and M_1 are discredited by the data. The chi square ratio to degrees of freedom for M and M are both greater than 5.0 and thus indicate a poor fit. The Goodness of Fit and Adjusted Goodness of Fit Index for M_0 and M_1 are also poor.

Examination of Table 8.1 shows that the statistics for M_3 and M_4 are exactly the same. As shown in Appendix 24 (Neil Diamond, personal communication, February, 1995), when there are three first order latent variables (as contrasted to four, as in the McAuley et al. (1989) analysis, models M_3 and M_4 are mathematically equivalent. For M_3, and of course the equivalent M_4, the chi square ratio has decreased to 4.5 which is still not very strong. Both Goodness of Fit and Adjusted Goodness of Fit Indices are not very high, well short of the recommended values of at least 0.8 (Neil Diamond, personal communication, February, 1995).

These results indicate that the structure of the revised IMI is not clear. The degree of overlap of items also suggests that the presence of three separate subscales is questionable. The goodness of fit indices suggest that the data does not fit the proposed factor structure well. The Chi-Square Ratio is much too high, the Goodness of Fit Index (GFI), and the Adjusted Goodness of Fit Index (AGFI)) are too low for a good fit of the data to the model, that is, the three factor structure. The Root Mean Square Residual (RMSR) is also substantially higher than recommended.

Examination of Table 8.1 shows that all the models do not fit well. All the χ^2 values are significant at the .001 level. These results agree with conclusions of Markland(1992) and the data presented by McAuley et al (1989) in suggesting that the factor structure of the IMI is not clear.

Following Markland (1992), another way of representing the results of the LISREL analysis for the presented three factor model is shown in Table 8. 2. This presents the goodness of fit results of the confirmatory factor analysis for the three subscales.

For each subscale statistics are given for both the null model and the model where each item loads on the latent variable. For Factor 2 (Perceived Competence) and Factor 3 (Effort/Importance) the goodness of fit indices were high, indicating that for these two factors the hypothesised model, that is, that items 2, 4, 9, and 11 load on perceived competence, and items 5, 7, and 10 load on effort/importance was acceptable. However, the results were less favourable for Factor 1 (Interest/Enjoyment). The goodness of fit indices were only moderate and the chi square goodness of fit test was highly significant at the 5% significance level. However, the chi square ratio was less than 4, indicating that the hypothesised model was acceptable (Byrne, 1989).

Table 8. 2 .

The results of fit in the model.

	Model	χ^2	df	p	GFI	AGFI	RMSR
Factor 1							
	Null	44.28	6	.000	.790	.649	.231
	Factor	15.8	2	.0001	.915	.577	.175
Factor 2							
	Null	22.46	6	.000	.400	.000	.548
	Factor	13.39	2	.031	.961	.803	.032
Factor 3							
	Null	87.42	3	.000	.571	.142	.434
	Factor	.42	2	.812	.997	.990	.029

* Schly loading an latent variable all equal.

8.4. Conclusion

McAuley et al. (1989) suggested that the IMI can be modified either by rewording items or removing whole subscales without major effects on reliability and validity. In the non competitive situation of this study, where stress was low, the tension sub-scale did not appear to function effectively on the basis of the internal consistency analysis in Chapter 3 It was decided that it should be omitted from the IMI for this study. In addition, several items were modified, producing an 11 item version which showed good internal consistency. The confirmatory factor analysis suggested that the final 11 item version may not have been measuring three separate subscales and raised doubts about the validity of this modified version of the scale.

Hardy and Markland (1992) have also expressed reservation about the validity of the IMI and they questioned the interpretation of the data given by McAuley et al

(1989), especially with reference to goodness of fit (Hardy personal commination, May 20, 1994). The inclusion of a perceived choice subscale has also been suggested by Hardy and Markland (1993) in line with Ryan's (1982) original work on the IMI. It is felt that the IMI used in the studies on monetary reward and feedback in this thesis did provide a general reflection of intrinsic motivation, although some reservation must be expressed about conclusions drawn in those studies. Perhaps, the validity of specific subscales is particularly in question. The overall intrinsic motivation score was the only measure derived from the IMI which was used in these two studies. It may not be sufficiently sensitive, as a measure of intrinsic motivation, given the factor analytic data on the subscales. For further research on intrinsic motivation in sport and exercise, a more thoroughly validated measure is required.

It is also interesting to note that the more specific comparison of goodness of fit statistics for each factor, comparing the null model with the observed data, raised doubts about the Interest/Enjoyment factor more than Perceived Competence or Effort/Importance. Recent work by Reeve (1989) has suggested that interest and enjoyment are independent elements of intrinsic motivation. Previously, the IMI did not distinguish between these two factors in relation to their role in intrinsic motivation. However, Reeve (1989) suggested that interest and enjoyment contribute two separate roles to intrinsic motivation and should be measured differently. He theorised that interest, with exploration and novelty, contributes to intrinsic motivation in one way, whereas enjoyment, including satisfaction of performance evaluation, contributes to intrinsic motivation in another way. Considering Reeve's view of the distinction between interest and enjoyment, it is possible that the IMI should be modified to reflect this difference (Tammen, cite, 1995).

At the same time, it should be born in mind that many of the IMI differences found for age, sex, treatment and occasion using ANOVA techniques, as well as much of the causal modelling analysis involving intrinsic motivation, did make sense. It was often consistent with predictions and with previous work. In conclusion, it thus seems that the patterns and trends in intrinsic motivation observed in the main studies are worthy of note. Their replication in studies using a more rigorously validated measure of intrinsic motivation or preferably, several such measures of intrinsic motivation, is necessary before the conclusions drawn about the influence of extrinsic reward on intrinsic motivation and recommendations made for the use of extrinsic reward by coaches and teachers can be made with total confidence.

Chapter 9. General Conclusion

9.1. Introduction

Studies conducted in the present thesis have explored the relationship between reward, performance, perceived competence and intrinsic motivation based on the Cognitive Evaluation Theory. In particular, the mediating effect of perceived competence on intrinsic motivation and the mediating effect of performance on perceived competence and intrinsic motivation have been investigated. Previous research mainly focused on the effect of reward, without considering the informational effect of performance feedback on perceived competence or intrinsic motivation. Recently, however, Vallerand and Blais (1986), Vallerand, Deci and Ryan (1987), and Deci and Ryan (1980, 1991) gave more attention to this matter. The present thesis has a different approach, compared to their method and approach. This thesis examined the effect of extrinsic reward on performance, as well as on perceived competence and intrinsic motivation and it also investigated the mediating effect of performance on perceived competence and intrinsic motivation over the longer term and when reward was removed.

In the past, research on the effect of reward on intrinsic motivation has concentrated on the short-term effect and did not test the long-term effect of the provision and removal of reward. Both studies in the present research went further by using a three occasions design, where a pretest to select those moderately high on intrinsic motivation was followed two weeks later by introduction of extrinsic reward. This delay allowed for testing of changes in extrinsic reward due to extraneous influences. Changes attributable to extrinsic reward, which were monitored immediately were also examined three weeks later, at the start of the third session. The third occasion was performance with no extrinsic reward which examined the effect of removing reward. This chapter considers the major issues addressed by these two studies, ways in which future research can improve on the present work, and implications for the use of extrinsic reward by coaches and teachers. The concluding chapter also assesses the use of modelling techniques and confirmatory factor analysis in this thesis.

9.2. Cognitive Evaluation: Reward, Perceived Competence And Intrinsic Motivation

The research in this thesis has demonstrated that extrinsic reward can increase performance, perceived competence and intrinsic motivation in the immediate and in the longer term. Paradoxically, the removal of reward did not show any considerable effect on performance, perceived competence or intrinsic motivation. This appears to contradict Cognitive Evaluation Theory (Deci, 1975; Deci & Ryan, 1980, 1985), which proposed that extrinsic reward tends to decrease intrinsic motivation in a task that is interesting to the subjects.

In the first study, monetary reward was offered and given in an overtly controlling manner, and yet immediate significant increases in performance, perceived competence and intrinsic motivation were observed. These increases were retained three weeks later and did not decline after performance was repeated with no reward offered or given. It was suggested that subjects might not have perceived themselves as controlled, but perceived the reward as information, typically positive, as most of them did improve. The second study, using positive feedback rather than monetary reward, essentially replicated these results. With positive verbal feedback as reward, adolescents of both sexes responded positively to the feedback, there being no evidence of females perceiving themselves to be controlled by it. The effect was retained after performance with no extrinsic reward offered or given two weeks later.

Deci's (1975) Cognitive Evaluation Theory proposed that reward has both facilitative and inhibitive effects on intrinsic motivation. On one hand, it can have a detrimental effect when it shifts the causality from within the individual to the external reward. It is proposed that this controlling aspect of reward leads to reduction of self-determination, and hence, reduces intrinsic motivation. Furthermore, reward can inform people about their incompetence, or reduce their level of perceived competence, and therefore decrease intrinsic motivation. On the other hand, reward may provide information about the person's competence, and therefore, increase intrinsic motivation. For this reason, it is important to determine which factor is salient in relation to a reward, as the salient factor may lead to either an increase or a decrease in intrinsic motivation. In the monetary reward study here, it is uncertain which aspect was more salient. It is suggested that the reward gave positive information based on the observation that perceived competence and intrinsic motivation increased, but, if this was the case it is still surprising that such an overtly controlling set of instructions was overridden in many subjects.

The results of causal modelling analysis revealed that the extrinsic reward, both monetary and verbal feedback, significantly, and directly influenced performance, perceived competence and intrinsic motivation in the overall model. As indicated in the overall model, performance 1 directly reinforced performance 2, and performance 2 in turn directly affected performance 3. The same chain reaction was observed with perceived competence and intrinsic motivation. This suggests that knowledge of previous experience has a strong influence on present perception. It appears also that subjects' interpretation of previous experience had a direct effect on their future behaviour. This observation has been supported by Bandura (1989).

Contrary to the findings of Vallerand and Reid (1984), this present study failed to demonstrate the mediating effect of perceived competence on intrinsic motivation. In view of the findings of Vallerand and Reid, this is difficult to explain. However, in the second experiment, the above mentioned mediating effect was observed in some variations of the model. The failure to consistently replicate the causal link between perceived competence and intrinsic motivation, is surprising for two reasons. First, it was clear that perceived competence and intrinsic motivation were both significantly enhanced by monetary reward in study 1 and positive feedback in study 2. Second, the modified IMI contained a four item perceived competence subscale. It was anticipated that this would facilitate the association with the one item scale, similar to that developed by Vallarand and Reid (1984), which was used to measure perceived competence. The studies conducted here suggest that the role of perceived competence as a mediator between extrinsic reward and intrinsic motivation is not always strong. An important issue for future research, then, concerns identifying factors which affect the mediating role of perceived competence on intrinsic motivation.

9.3. Performance Related to Perceived Competence and Intrinsic Motivation

The present thesis observed that reward facilitated performance. This finding was also demonstrated in studies conducted by Kamal (1989), Martens, Burwitz and Newell (1972), and Thomas and Tennent (1978). McGraw (1978) suggested that reward often generates a detrimental effect on performance, but can increase performance such as, creative activity, and incidental learning when a task is highly interesting to people, or when the solution to the task is open-ended. The present research is consistent with previous research (Kamal,1989; Rushall & Pettinger, 1969) which found that extrinsic rewards enhanced performance. While the basketball free throw shooting task was at least moderately interesting for participants (Mean=51 on a scale from 11 to 77), the closed nature of the task and the fact that most students improved with practice might have counteracted any effect which McGraw's work suggested. Although a reward itself may be seen as an instrument that controls behaviour, to some extent it also can be perceived as an indication of competence. This was demonstrated in the performance of most of the subjects in the present studies. In such a case, improved performance can also become an indicator of one's skills and abilities. Hence, performance in both studies was associated with increased perceived competence. Performance-contingent reward is particularly prone to be associated with the subjects' performance progress. When the size of the reward reflects the scale of improvement, its role can become more informational than controlling. Other researchers (Enzel & Ross, 1978; Harackiewicz, 1975; Karniol & Ross, 1977; Ross, 1976; Schunk, 1983) have made the same observation in their research. Deci and Ryan (1991) emphasised that performance interpretation and the perception of personal competence are based on the subjects' sense of self-worth in the activity. In sport, where the participants want to challenge a previous record, reward is an acknowledgment of success, mastery, and superiority. From this perspective, the feeling of challenge causes the subject to exert more effort towards the task. This may lead to an increase in intrinsic motivation.

When parts of the model were analysed separately, in comparison to the overall model, using LISREL structural equation modelling techniques, it was shown that performance significantly affected perceived competence and intrinsic motivation. This happened even more strongly when the reward was removed. Along the same line, Vallerand and Blais (1986) also showed that the level of performance significantly affected perceived competence by using causal modelling. They used the Cognition-Affect-Intrinsic-Motivation Model to determine how perceived competence changes when performance has changed. Later, Vallerand, Deci and Ryan (1987) suggested that perceived competence is influenced by perception of performance, which in turn leads to change in intrinsic motivation. Deci and Ryan (1988) proposed that performance could mediate between reward and intrinsic motivation, using the term "performance-mediated effect". Reward can influence performance in the task and then changes in performance lead to the change in intrinsic motivation, because improved performance is perceived to reflect competence.

It is also noteworthy that performance had a strong direct effect on perceived competence in study two where positive verbal feedback was offered. In the first study, when the results were analysed, extrinsic reward significantly affected both perceived competence and intrinsic motivation, and perceived competence had a significant mediating effect on intrinsic motivation. However, when performance was analysed with extrinsic reward, perceived competence and intrinsic motivation, extrinsic reward had a significant effect on performance. On the third occasion when no reward was offered, and when partial models were examined, performance significantly and directly influenced perceived competence and intrinsic motivation. However, the mediating effect of perceived competence on intrinsic motivation was not found. This was illustrated in the overall causal models for studies 1 and 2. The results suggest that the mediating influence of performance on perceived competence and intrinsic motivation, as well as that of perceived competence on intrinsic motivation, appear to depend on the nature of the reward and the context in which it is delivered. Future work needs to examine the way in which participants perceived the reward, performance, feedback, both intrinsic and extrinsic, and their role in the situation. In the first experiment, the mediating effect of performance on perceived competence might have not reached significance because of the powerful effect of monetary reward. In the second experiment, when verbal feedback, possibly a weaker reward, was used, performance showed a greater effect on perceived competence. This view is confirmed by the structural equation modelling observation from the partial models for both studies. In the partial model in study 1, when monetary reward was removed on Occasion 3, the influence of performance on perceived competence became significant. In study 2, where verbal feedback was the extrinsic reward, performance showed a significant effect on perceived competence on Occasion 2, when feedback was given, as well as on Occasion 3.

Unexpectedly, when reward was removed, performance continued to affect intrinsic motivation directly. Vallerand and Blais (1986) suggest the same result, even though it is not evident in the published research. It can be concluded that a highly salient reward could minimise the mediating effect of performance on perceived competence, whereas with a less potent reward, the information available directly from performance might be more salient. This indicates that perception of performance can promote changes in perceived competence and intrinsic motivation, as suggested by Vallerand and Blais (1986). However, in the overall model, perceived competence did not act as a mediator of intrinsic motivation to a significant level, contrary to Cognitive Evaluation Theory (Deci, 1975). Further research is needed to determine whether certain performance situations, such as those represented by many sport tasks, affect the salience of perceived competence relative to information from the task itself, that is, the salience of information coming directly from performance. This would suggest a modification to Cognitive Evaluation Theory, rather than undermining the entire theory.

9.4. Long Term Effect of Reward

The long term effect of reward on performance, perceived competence and intrinsic motivation, was examined, using direct measures of perceived competence and intrinsic motivation. A repeat of performance was also done, following a time lag after introduction of the extrinsic reward during which no further experimental manipulations were made. The ANOVA results of the first study showed that three weeks after the reward was given, performance, perceived competence and intrinsic motivation remained at the same increased level in spite of the absence of any further reward, and with the opportunity for many extraneous factors to influence perceived competence and intrinsic motivation. The same observations were also made from the causal modelling analysis. Thus, the introduction of reward increased performance, perceived competence and intrinsic motivation and those increases were sustained three weeks later despite subjects being free to do whatever they chose during that period. A critical factor in determining a change in perceived competence and intrinsic motivation in the long term appears to be the subjects' perception of their performance rather than interest in the reward itself. That is, the subjects may have thought of the performance-contingent reward as a reflection of their ability or effort. In this study, perception of performance could have had a significant effect on their self-evaluation. Previous research based on the measurement of intrinsic motivation using the free choice method, could not examine the long term effect of reward on intrinsic motivation because, with performance on the task being the measure of intrinsic motivation, that type of research had no independent measures of perceived competence and intrinsic motivation prior to any repeated task behaviour or performance. The first study here, measured this long-term effect using the perceived competence scale and the IMI and found that the immediate positive effect of reward on performance, perceived competence and intrinsic motivation did not change after three weeks.

The second study here did not measure perceived competence and intrinsic motivation directly prior to performance on Occasion 3 because the effect was clearly demonstrated in study 1. The strong causal links, observed in study 2 structural equation modelling, between perceived competence and intrinsic motivation on Occasion 2 and on Occasion 3 after performance, do suggest that the increases in perceived competence and intrinsic motivation were retained over the longer term. The positive results obtained for the maintenance of increases in performance, perceived competence and intrinsic motivation in the longer term are promising. They suggest that, in skills where learning occurs, improvements in performance can be encouraged by rewards presented on a single occasion, and they can be retained in the longer term, even when there is no further reward. In fact, perceived competence and intrinsic motivation were also enhanced and remained at their higher levels three weeks later in both studies. More work is needed to confirm that the manner of presenting reward (contingency) and the nature of the task, play key roles in determining the nature of the long term effects. Then, coaches and teachers will be able to employ rewards selectively, but with greater effect.

There is some concern that the number of variables included in the full LISREL models for each study is rather large in relation to the number of participants in that study . This could weaken the models . For future analyses it would be interesting to use the LISREL models change in performance, perceived competence, and intrinsic motivation scores from occasion 1 to 2, and from occasion 2 to 3. This would reduce the ratio of variables to participants and could enhance the resulting models.

9.5. Removal Of Reward Effect

The effect of removing a reward was examined in both studies by further experimental manipulation where performance was repeated with subjects aware that no reward was being offered and with no reward given following performance, as defined earlier (section 5.3.2.5). In the first main study, monetary reward was promised and given, and then, three weeks later it was removed with no immediate effect on performance, perceived competence and intrinsic motivation. These all remained at the increased levels attained when reward was offered, compared to a group which never received a monetary reward. In the second study, reward was not offered, but was given, in the form of positive normative verbal feedback, before performance on Occasion 2. Three weeks later, performance was repeated and no positive verbal feedback was given before or after performance. Again, performance, perceived competence and intrinsic motivation all retained their increased levels, despite the removal of reward, compared to a group which received only neutral feedback on Occasion 2. These findings are not consistent with previous research. Lepper and Greene, (1976) found that removal of reward had a detrimental effect, compared with a no reward group and an unexpected reward group. Their research, however, used the free choice method of assessing intrinsic motivation and did not assess perceived competence or standards of performance. Also, removal of reward was done shortly after the reward occasion. Few studies have examined the effect of removing the reward, especially in the longer term. Feingold and Mahoney (1975), Denman, Feltz and Landers (1981) and Loveland and Olley (1979) all found that a negative effect of introducing a reward on intrinsic motivation was ameliorated by its removal, that is, intrinsic motivation increased again to its original levels. Only Loveland and Olley also examined performance. They found the same pattern of a return to earlier higher levels. In both studies of the present thesis, in comparison, performance, perceived competence and intrinsic motivation remained at the higher levels attained when reward was offered, three weeks after reward was given, and after repeated performance with no reward. In the present studies, performance involved a skill which was clearly still being learned by most subjects. This might explain, in part at least, the retention of performance scores. Specifically, the subjects were unlikely to unlearn the skill. This might also explain, to some extent, the retention of increased perceived competence and intrinsic motivation levels, as the causal · modelling, especially the structural equation model, suggested that performance influenced both perceived competence and intrinsic motivation in the absence of the reward on Occasion 3. This mediating role of performance and especially, its relation to various types of reward or their salience, merits further study.

Another difference between this study and the others which have investigated the longer term removal of reward, is that in those studies introduction of the reward led to a decrease in intrinsic motivation. Here, the reward was associated with increases in performance, perceived competence and intrinsic motivation. Attribution theory proposes that a self-serving bias functions, which acts to protect self esteem and maintain the most positive view of oneself possible in the light of current information (Iso-Ahola, 1977; Miller & Ross, 1975). Based on the action of such a mechanism, it might be predicted that on the removal of information (extrinsic reward) which lowered intrinsic motivation and perceived competence, as in the other studies (Feingold & Mathoney, 1975; Denman, Feltz & Landers, 1981; Loveland & Olley, 1979), intrinsic motivation and perceived competence would increase, returning to a level close to its original position. In the present studies, where performance, perceived competence and intrinsic motivation had increased as a consequence of introduction of the extrinsic reward, upon removal of the reward, the self-serving mechanism might be expected to operate to maintain the increased levels. Hence, in both types of study the participants end up by perceiving themselves in the best possible manner. This is a very interesting issue, which is worthy of further testing.

The present research examined the longer term effect of introducing reward separately from the effect of withdrawing reward in the long term. The effect of removal of reward is the effect on perceived competence or intrinsic motivation of removing a reward which was previously offered. In much of the previous research it was not possible to distinguish the long term effect from the effect of removing the reward. This is because most studies which have examined intrinsic motivation in the longer term have used free choice activity as the measure of intrinsic motivation, with no independent performance measure (e.g., Feingold & Mahoney, 1975). Also, these studies have typically not measured perceived competence separately. Because the present study measured perceived competence and intrinsic motivation by questionnaire and had an independent measure of performance, basketball shooting, it was possible to examine the long term effect of reward on perceived competence and intrinsic motivation. Similarly, it was possible to independently examine the effect on perceived competence and intrinsic motivation of removing a previously given reward, by testing students on the Perceived Competence Scale and the Intrinsic Motivation Inventory (IMI). Both ANOVA and modelling analyses indicated that levels of perceived competence and intrinsic motivation were unchanged, after the three week delay (longer term effect) and after performance without reward (removal effect). These results, which could not be found in any other published work, show promise for the use of rewards in sport.

It should be noted that the same conclusion cannot be arrived at for performance, for a similar reason to that which hampered previous research, that is, the performance measure was part of the withdrawal process. Because students were informed before they performed that there would be no reward, performance must be considered to reflect the effect of withdrawing reward, not the longer term effect of the reward. Nonetheless, the finding that performance at this stage was not changed from that on Occasion 2 does suggest that it did not decline in the longer term, since there was no change to the previous conditions, while removal of the reward must be considered to be a change where negative consequences were more likely. In study 2, where there was no test of perceived competence and intrinsic motivation before performance on Occasion 3, a similar argument can be made. This is based on the retention of high levels of perceived competence and intrinsic motivation after performance with rewards removed. The claim that perceived competence and intrinsic motivation remained higher on Occasion 3 can be supported by the strong causal paths from perceived competence and intrinsic motivation after performance on Occasion 2 to the same variables after performance on Occasion 3. The argument regarding performance on Occasion 3, repeats that for performance in study 1. In both studies, the strong causal path from performance on Occasion 2 to Occasion 3, again, supports the claim that performance remained at its increased level over the longer term.

Overall it is argued that the strong, positive effects of introducing a monetary reward (study 1) or positive feedback (study 2) on performance, perceived competence and intrinsic motivation, were retained in the longer term, when no further manipulations were made, and after a delay, following which the reward was removed. The design of the studies, especially study 1, and the use of powerful modelling techniques, permit these claims, which have important implications for coaching and teaching, to be made.

9.6.Limitations of The Present Studies

Several limitations of the present research which could be improved upon in future studies, should be noted. First, the present research did not include an independent measure of the level of self-determination. Theoretically, the level of self-determination, can be influenced by the reward, as well as by the nature of its delivery.

It can become a major factor which influences changes of intrinsic motivation. In the first study in this thesis, the monetary reward was intentionally offered in what was intended to be a highly controlling manner. Results of modelling analyses suggested that an increase in perceived competence was not the main reason why intrinsic motivation increased. It has been speculated that the increase in intrinsic motivation might have been influenced by participants' perceptions of their level of control in the situation. Specifically, offering a performance-contingent reward might have made the students feel that they controlled whether they received a reward, thus, increasing their self determination, which increased intrinsic motivation. The absence of a direct measure of self-determination meant that this proposition could not be tested using the ANOVA or the modelling statistics. Ryan (1982) did include a measure of perceived choice in his development of the IMI. McAuley, Duncan, and Tammen (1989) omitted it from their work, suggesting its psychometric properties were not fully developed. At the time when the present work was conducted this was the current view and was followed in modifying the IMI for use here. Since then, Markland (1992) has recommended use of the perceived choice subscale. Whether it is this or a measure devised specifically for the task, a test of self-determination is needed, as assumptions from experimental manipulations cannot be confidently made unless the role of self-determination is examined directly.

The present thesis used a version of the IMI with only 11 items, with modification to some questions, from the 16 items of the IMI. That 16 item version was modified by McAuley et al. (1989) from Ryan's original and their own 18 item version. To test the reliability of the revised IMI for the present research, its internal consistency and test-retest reliability were examined. It was through four internal consistency studies, two with only small samples, that the 11 item version emerged, including removal of the pressure-tension subscale for this non-competitive task. The fourth study, with a substantial sample, did provide acceptable internal consistency statistics, for the three remaining subscales, as well as for the overall IMI. Combined with a very strong result from a four week test-retest reliability study, that is one week longer than any break in the two main studies, the results of the fourth internal consistency study were thought to provide satisfactory evidence of the reliability of the revised version of the IMI. It was assumed that the established validity and factor structure would be retained in the modified IMI. Concern about the factor structure was expressed by others working in the field, after the main studies were completed (Hardy, personal communication, August 1993; Markland, personal communication, August 1993). It was on this basis that a confirmatory factor analysis was conducted. The results of that analysis supported the reservations of Hardy and Markland, suggesting that the three factor structure did not emerge strongly, although there are some difficulties in examining a three factor structure, using LISREL to perform Confirmatory Factor Analysis. There was evidence of a single underlying factor, suggesting that the test was probably giving some reflection of an intrinsic motivation-related variable. This would be supported by the manner in which the IMI performed in the two main studies, where it provided results consistent with predictions about intrinsic motivation in most cases. The absence of significant causal paths with perceived competence was the main exception to this and it is certainly recommended that the measurement of intrinsic motivation be reconsidered in future research. It is possible that an analysis using each subscale of the IMI (interest-enjoyment, perceived competence, effort-importance) would be illuminating. Examination of the subscales in the LISREL analyses could clarify relationships. In such analyses, the perceived competence subscale could be used as an independent measure of perceived competence, strengthening the measurement of this variable. At the same time, examination of interest/enjoyment and effort/importance as separate aspects of intrinsic motivation could provide a clearer operationalisation of that variable. It was not possible to reanalyse the data in this way, because the raw data for the main studies was lost during moves between Australia and Korea and within Melbourne, while only the IMI scale scores for the main studies were recorded in the Appendices.

Recent reconceptualisation of the nature of intrinsic motivation (e.g., Vallerand, Pelletier, Blais, Briere, Senecal & Vallieres, 1992) and of the nature of extrinsic motivation (e.g., Deci & Ryan, 1985, 1991), along with refinement of the concept of amotivation (e.g., Deci & Ryan, 1985, Vallerand & Bissonnette, 1992), has stimulated the development of a new scale, which measures three kinds of intrinsic motivation, three kinds of extrinsic motivation, and amotivation (Pelletier, Fortier, Vallerand, Tuson, Briere & Blais, 1995). The conception of motivation underlying the Sport Motivation Scale (SMS; Pelletier et al., 1995), which is the English language version, based on the French language original, L'Echelle de Motivation vis-a-vis les Sports (EMS; Briere, Vallerand, Blais & Pelletier, in press), is that the seven types of motivation identified by these researchers lie along a continuum of self-determination with amotivation toward one extreme and highly self-determined intrinsic motivation toward the other extreme. This view of motivation might be very useful in explaining why some forms of extrinsic motivation lead to behaviour which appears to be more reflective of intrinsic motivation. Application of the SMS, which was designed specifically for use in sport, might lead to more sensitive measurement of motivation, particularly in terms of its degree of self-determination. It is to be hoped that it will be widely employed in examining motivation in sport in the future.

In their reconceptualisation of intrinsic motivation, extrinsic motivation and intrinsic motivation are no longer seen as discrete alternatives. Rather, a number of alternative forms of intrinsic motivation and extrinsic motivation are identified. These are located along a continuum, depending on the degree to which each reflects self-determination. It is, thus, the concept of self-determination that provides the common thread in this view of motivation. Toward one end of the continuum is amotivation, a state that Pelletier et al. (1995) liken to learned helplessness (Abramson, Seligman & Teasdale, 1978), in that the individual "does not perceive contingencies between their actions and the outcomes of their actions" (p. 38). The amotivated person, therefore, perceives little or no self-determination in the situation. At the other extreme is intrinsic motivation, which is seen to be highly self-determined. It has been distinguished into three types, based on the existing research. Intrinsic motivation to know is associated with performance of an activity for the pleasure and satisfaction associated with exploring, learning, trying to understand or knowing something new. The pleasure or satisfaction experienced when one attempts to accomplish, achieve or create something is termed intrinsic motivation toward accomplishment. Interacting with the environment in ways that are intended to enhance feelings of competence are identified with this form of intrinsic motivation. Fun, excitement, sensory pleasure or flow are the characteristics of the third type of intrinsic motivation, intrinsic motivation to experience stimulation. This tripartite view of intrinsic motivation does not claim that the different forms of intrinsic motivation occupy different locations on the continuum of self determination, they are all highly self-determining. Its value lies in the refinement of the nature of intrinsic motivation, which should benefit its operationalisation and measurement, as exemplified by the three intrinsic motivation subscales of the Sport Motivation Scale developed by Pelletier et al. (1995). It is to be hoped that this more refined and sensitive definition of intrinsic motivation will produce more consistent prediction of behaviour in performance situations.

The forms of extrinsic motivation developed by Deci and Ryan (1985, 1991), on the other hand, do represent different locations along the self-determination continuum. This more sophisticated conceptualisation, which reflects developmental processes in extrinsic motivation, has the potential to explain many of the problematic aspects of previous research on extrinsic motivation. Not all extrinsically motivated action is behaviour that is controlled by external sources, in this view. Such behaviour is attributed to extrinsic motivation that is termed externally regulated, that is, it is controlled by such factors as material rewards or praise from significant others, so self-determination is low. This, then, is the form of extrinsic motivation closest to the amotivated state. There is no internal aspect to this form of extrinsic motivation. With experience, an individual can come to internalise the external source of motivation, so that it no longer needs to be present. Guilt, anxiety, embarrassment or shame can be the basis for action. This form of extrinsic motivation is said to be introjected. A further progression can occur whereby the person comes to value the activity for its own sake, perceiving it to be important, the individual performs the activity by choice. Pelletier et al. (1995) stress that the motivation is still performed for extrinsic reasons, such as to achieve personal goals, but it is internally regulated and self-determined. Identification is the term used to describe this type of extrinsic motivation. The great potential in this conceptualisation of extrinsic motivation is that variations which have emerged in research between different groups, in different contexts, for different tasks, and with different reward contingencies can be predicted or explained on the basis of these different levels of extrinsic motivation. For example, on the basis of internalisation of the subcultural norms associated with a sport, performers who are more experienced or play at a higher level might be predicted to have moved from externally regulated to introjected, or even to identified, forms of extrinsic motivation. Being more self-determined, their reaction to various situations would be predicted to differ from that of beginners in the sport. Explanation of previous findings on the basis of this new conception is not as persuasive as the generation and testing of predictions. This appears to be an exciting new direction for research in intrinsic motivation. Should it prove fruitful, the development of techniques to facilitate the shift from externally regulated to identified and fully integrated motivation would be of great benefit to coaches and teachers.

For the purposes of studying the relationship between perceived competence and intrinsic motivation, the use of a single scale to measure perceived competence must also be of some concern. While Vallerand and Reid (1984) seem to have used this approach successfully, and this was the basis for its inclusion here, measuring perceived competence by the use of a scale consisting of several items would seem likely to increase reliability. One issue which is puzzling is the absence of significant causal links between the perceived competence scale and the IMI, which contained four items measuring perceived competence. With the introduction of more powerful statistical modelling techniques, which define latent variables more effectively from more items and more scales, it would seem to be advisable to develop a number of different measures of intrinsic motivation and a number of perceived competence measures, preferably using different measurement modes, that is, they should not all be questionnaires with Likert scales, to allow the modelling statistics to really refine the latent variables, hence giving more definitive models of the relationships.

Confining the sample to students aged 13 to 16 years old may have limited the generalisability of the results in the present work. Most previous research focused on children aged under 12 years or on adult age college students. Based on Nicholls view that it is between 12 and 14 years of age that children draw a distinction between the roles of effort and ability, selection of the samples in all studies reported here to span those ages seems sensible. The results of the studies in the present thesis certainly seem to demonstrate the need for further study of this age range, which has been under-represented by previous research. At the same time, extension of the present methods to a wider age range, including younger children and adults would broaden the generalisability of findings and might also clarify further whether cognitive developments interact with the motivational processes studied here. In terms of generalisability, it would also be useful to study a range of sports tasks.

It has been suggested that the analyses here do not permit discussion of the relationships between changes in variables. This is accepted and any statement which suggests that relationships between changes are being inferred from the present analyses should be discounted.

9.6. Issues Raised For Future Research

The studies reported in this thesis raise a number of issues which should be addressed in future research. Central to the current thesis was the relationship between reward, perceived competence and intrinsic motivation, as proposed by Cognitive Evaluation Theory, and the role played by performance in mediating between reward, perceived competence and intrinsic motivation. The role of perceived competence might be affected by performance and the mediating role of performance might depend on the relative saliency of the reward. Thus, the level of salience of rewards should be investigated further, as it appears to influence how reward controls behaviour. It is important, therefore, to determine or manipulate the level of salience of the reward, as this might well affect its effects on self-determination and information regarding competence. Further, the salience of the reward relative to information which can be gleaned directly from performance would appear to be an important factor, at least in activities where performance is important, such as most sport tasks.

Also, it is necessary to further develop intrinsic motivation measures, which are acceptable in terms of internal consistency, test-retest reliability, construct validity, and factor structure. Previous research often used questionnaires without testing reliability. Douglas (1993), for example, actually removed the pressure-hyphen tension subscale aposteriori. However, the present thesis tested the reliability and validity of the questionnaire. The results of the confirmatory factor analysis in the present study suggested that the t-values for the loading of each questionnaire item on the hypothesised latent dimension was statistically significant, indicating that all 11 items reflected a conception of intrinsic motivation. Further work needs to be done, however, since Goodness-of-Fit-Indices were not unequivocally supportive of the three subscale structure of intrinsic motivation proposed in the version of the IMI used here. This goodness of fit problem is not uncommon with LISREL studies. This is one reason why Joreskog and Sorbum (1981) suggest that the chi-square test only be used in a model comparison sense, rather than as a strict significance test.

Regarding Goodness of fit test, there have been a number of alternative method for judging the fit of model that have appeared in the literature and this is still an active area of research with considerable difference between researchers as to appropriate methods that should be used. All models developed in this thesis need to be considered in this light. Future work should examine the model using the more recent fit indications.

There has been a lack of correlation between behavioural and self-report questionnaire measurement in previous research on intrinsic motivation (Dollinger & Thelen, 1978; Folger, Rosenfield & Adelman, 1980; Smith & Pittman, 1978; Weiner & Mander, 1977, 1978). Deci and Ryan (1991) suggested that the free choice measurement of intrinsic motivation may not be a totally appropriate approach when used in contexts that arouse ego-involvement, because the conception of intrinsic motivation differs between ego-involving and task-involving situations. Comparisons between research using the two methods of measurement might not be comparing effects of reward on the same aspect of intrinsic motivation. Furthermore, Reeve (1989) has suggested that interest and enjoyment are two distinct and separate factors in determining intrinsic motivation. For future research, it would engender greater confidence if several different measures of intrinsic motivation were employed, especially if they reflected different modes of measurement. This would also help in structural equation modelling by giving more data from which latent variables could be clearly identified. The recent development by Pelletier, Fortier, Vallerand, Tuson, Briere, and Blais (1995) of the Sport Motivation Scale (SMS) to measure intrinsic and extrinsic motivation, and amotivation in sports on the basis of self-determination has great potential for use in this way.

It is crucial to determine how the way in which reward is presented affects level of self-determination. Reward contingency has been noted to be an important issue in understanding the reward and intrinsic motivation relationship (Ryan, Mims & Koestner, 1983; Harackiewicz, 1979). The presentation of a performance-contingent reward in the first study here was one of few occasions when this has been done, especially in sport. Results contradicted many other reward and intrinsic motivation studies, which have used task-contingent or task-non-contingent rewards, but the results were consistent with the expectations of those who have studied performance-contingent rewards, at least in the short term. The evidence is mounting in support of the view that performance-contingent rewards typically enhance intrinsic motivation, as well as performance, but further work, more focused on this issue, is needed.

It is also necessary that measuring instruments be devised to measure the effect of reward on self-determination. As noted previously, it was not possible to determine what processes did underlie observed changes in intrinsic motivation when causal modelling analyses indicated that, although extrinsic reward had a large effect on perceived competence and intrinsic motivation, there was no significant path from perceived competence to intrinsic motivation. According to Cognitive Evaluation Theory, there are two main processes whereby extrinsic rewards affect intrinsic motivation, namely, by enhancing perceived competence or by increasing feelings of internal control and hence, self-determination. Thus, when perceived competence is not a significant mediator, the most likely alternative explanation is that self-determination was increased by the reward and so intrinsic motivation was enhanced. It has already been argued that the performance-contingent reward in study 1 could have given participants a feeling of control over the situation, while the presentation of the reward itself might have been further information that the individual was controlling the reward process by their performance. In the second study, both extrinsic positive feedback and intrinsic feedback from improved performance might have provided similar information. With no independent measure of self-determination, it is not possible to draw conclusions on this issue.

The inclusion of Ryan's (1982) perceived choice subscale in the IMI could provide a solution to this measurement problem. It is argued here, however, that inclusion, like the inclusion of a perceived competence subscale in the IMI, is more likely to confound the underlying mediating process, whether that involves enhancing competence or self-determination, with the outcome variable, intrinsic motivation. To examine, more clearly, the relationship of these two major cognitive processes, perceived competence and self-determination, it is necessary to develop independent tests of perceived competence, self-determination, and intrinsic motivation, while avoiding the confounding of perceived competence and self-determination in the measurement of intrinsic motivation. The effect on intrinsic motivation, and the paths from perceived competence and self-determination to intrinsic motivation, when either perceived competence or self-determination is intentionally manipulated, would reflect the influence of self-determination and perceived competence as processes underlying intrinsic motivation. Direct and independent measurement of perceived competence and self-determination would also ensure a manipulation check. In the first study here it was intended to make the presentation of performance-contingent reward highly controlling. Results, however, suggest it was not perceived that way, but without a direct measure of self-determination this cannot be confirmed. The use of structural equation modelling techniques, further, demands the development of multiple measurement of perceived competence and self-determination, which are themselves latent variables in modelling terms, because a latent variable is poorly described by a single behavioural indicator. Thus, two, or preferably three, tests of each, with different methods of measurement for perceived competence would satisfy modelling processes.

The measurement issue does not stop at perceived competence and self-determination. For future work, revised measurement devices are required to test intrinsic motivation. The involvement of perceived competence and self-determination in the measurement of intrinsic motivation, through the perceived competence and perceived choice subscales confounds perceived competence and self-determination with intrinsic motivation. Reflecting on this, it remains surprising that significant causal paths from the single item perceived competence scale to the IMI were not consistently found in the two studies reported here, where the version of the IMI developed for the studies included four out of eleven items which referred to perceived competence. Future research should focus on intrinsic motivation scales based on a valid theoretical conceptualisation which distinguishes intrinsic motivation from perceived competence. As noted earlier, Vallerand, Pelletier, Blais, Nathalie, Fortier and Tuson (1995) developed a reformulation of the measurement of motivation specific to sport, which they called the Sport Motivation Scale (SMS). The SMS consists of three subscales (intrinsic motivation, extrinsic motivation and amotivation), but in particular the reformulation of intrinsic motivation consists of intrinsic motivation to know (curiosity and exploration), to accomplish (mastery and efficacy) and to experience stimulation (pleasure and aesthetic experience). Based on the recent conceptualisation of the nature of intrinsic motivation, research investigating the relationship between perceived competence and intuition motivation should be less confused. Pelletier et al. suggested that Weiss, Bredemier, and Schewchuk's (1985) "Self Report Scale of Intrinsic versus Extrinsic Orientation" questionnaire pits intrinsic motivation against extrinsic motivation in an unrealistic manner, and McAuley, Duncan and Tammen's (1989) version of the IMI appears to have a weak factorial structure. It is also necessary to measure perceived competence more rigourously in sport domains, as Vallerand, Blais, Briere and Pelletier (1989) did using a five item scale, although the alpha value they cited of 0.59 was low. Nevertheless, future work using modelling techniques needs to use several independent measures of each critical variable, perceived competence, self-determination and intrinsic motivation. The recent reconceptualisation of intrinsic motivation and the development of new measurement devices might be particularly useful for future research along these lines.

Future research should explore further the long term effects of rewards and the effect of the removal of reward on performance, perceived competence and intrinsic motivation. Bate (1979) criticised researchers for not fully investigating the long term effect of reward on intrinsic motivation. In order to explore this issue, the present research sought to discover the long term effect of the presence and absence of reward on intrinsic motivation. In the first study, three weeks after the reward was terminated, perceived competence and intrinsic motivation were measured before the performance of the activity was repeated. These findings represented a long term effect. After this measurement, the reward was not offered or given during repeated performance. That is, it was effectively removed, and the perceived competence and intrinsic motivation of participants were again measured. This reflected the effect of removing the reward on perceived competence and intrinsic motivation. It was suggested that the studies conducted here permitted separate examination of the long term effect of reward and the effect of removal of reward. The free choice measurement method confounds the measurement of performance and intrinsic motivation. Many previous studies could not make this distinction (Amabile, 1983; Lepper & Greene, 1976; McGraw & McCullers, 1979). The measure of intrinsic motivation was the performance, so the long term effects of intrinsic motivation could not be measured before performance without extrinsic reward. Other studies (Deci, 1971, 1972 a, b; Lepper, Greene and Nisbett, 1973) have examined the effect of removing rewards on intrinsic motivation, but not on performance, as they did not measure this variable. The present findings that both the long term effect and the effect of removal did not show any reduction in reward-enhanced performance, perceived competence or intrinsic motivation are important. They need to be replicated in other contexts, before strong conclusions can be drawn for theory and practice.

Previous research tended to interpret results without considering the perception of performance. However, the performance of many tasks does involve intrinsic feedback which informs performers about their performance. This is a factor which could crucially affect perceived competence. Vallerand and Blais (1986) suggested that perception of performance has a significant effect on any change in perceived competence, and this perception is derived from individuals' feelings about their performance, without the use of any reward. However, in order to fully understand the perception of performance effect on perceived competence and intrinsic motivation, the researcher should measure level of performance perception. Also, as noted previously, the present studies suggest that the roles of performance and perceived competence as mediators might vary depending on the salience of the reward relative to information coming directly from performance, as well as the salience of controlling and informational perceptions of the reward. Future work, thus, needs to examine the role of performance in the presence of various rewards. Further, a fruitful direction for future research is to manipulate the type, level, and context of presentation of rewards, examine experientially their salience relative to performance and investigate the role of rewards and performance using structural equation modelling

In order to understand the effect of reward on performance, perceived competence and intrinsic motivation, researchers should employ causal modelling. There are some studies which have used regression-based causal modelling techniques (Vallerand & Reid, 1984, 1988; Whitehead & Corbin, 1991). These techniques can examine, more closely, the causal relationships between reward, performance, perceived competence and intrinsic motivation. This is especially important in terms of the need to understand the mediating processes which influence the effect of extrinsic reward on intrinsic motivation. Thus, this method addresses the question of whether an observed shift in intrinsic motivation is mediated by perception of performance and or perceived competence, or whether it is mediated by other variables. Little research to date, uses structural equation modelling, such as LISREL, as the causal modelling technique, to test the effect of reward on intrinsic motivation. LISREL analysis can be used to test the fit of a proposed model to the observed data. It is desirable to use this approach to refine the model proposed to explain the relationship between variables in order to improve the methodology in this field. Further, research using structural equation modelling also has the advantage that parts of complex models can be examined separately, as they were in this thesis. This can be especially useful when a very strong path, such as those typically existing between consecutive tests of the same variable, saturates other interesting relationships.

Vallerand and Blais (1986) and the present research, especially study 2, found that level of performance significantly and directly influenced intrinsic motivation. Cognitive Evaluation Theory appears to interpret only the relationship between reward and intrinsic motivation. It might be that other variables, such as perception of performance, play important roles under certain conditions. It is necessary to question how the perception of performance influences intrinsic motivation, so that a new theoretical model might be developed fully to explain the relationships involved in the extrinsic reward and intrinsic motivation area. Such a model could include the perception of performance between reward, perceived competence and intrinsic motivation.

9. 8. Implications for Practice

The research conducted in this thesis is different, in various respects, to any other research in the literature. At the same time, the present research builds on previous work, in some areas supporting it, in others, contradicting or questioning what has gone before. Some implications for practice can be derived from the research, but they carry the rejoinder that further research is needed to replicate and extend the current findings. One implication of the studies in this thesis is that, in the sport area, coaches and teachers should use performance-contingent rewards, which are meaningful and clearly related to information from the progress of performance. For instance, students and athletes who display early interest in recreational activity and sport will not necessarily diminish that level of interest as a result of rewards, provided that the rewards indicate the level of achievement in the task. Frequently, if they are interested, participants will achieve well and perceived competence will be enhanced. It is possible that when subjects are aware that rewards are contingent on progress of performance, rewards provide information about competence. Competence is often difficult for people to determine from performance alone. Therefore, the reward might give further information to the subjects regarding their competence, especially when coaches and teachers try to present it in that way. For example, in a context like the monetary reward study in this thesis, a coach might say; "Your performance improved by five baskets. That is why you received $2.50 reward. You are becoming a much better free-throw shooter." This statement attempts to emphasise the link between performance and perceived competence, through the reward.

It seems clear that level of performance, perceived competence and intrinsic motivation are affected more positively for younger students than for older adolescents. This probably occurs by extrinsic rewards, or tangible, verbal rewards, imparting positive information about one's improvement in performance and one's perceived competence in dealing effectively with the task. Thus, coaches and teachers should pay particular attention to the use of rewards to motivate and to improve performance of younger adolescents. Nevertheless, rewards which emphasise improvements in skill are likely to have positive effects on older adolescents as well. Rewards can be used with both genders equally effectively. Again, the manner of presentation and interest in the task will affect response. Generally, where the reward provides clear, positive information about competence and self-determination, the weight of evidence suggests that females will respond with positive shifts in intrinsic motivation, just as males do. Coaches and teachers should be aware that the extrinsic reward and intrinsic motivation relationship could well be task specific, where the task is attractive to the gender involved, positive effects of competence enhancing feedback are likely to occur.

Teachers and coaches should not be afraid of using a reward as a motivational tool to improve performance. While imparting information concerning ways of improving performance, educators can offer rewards that reflect growth of competence in learners' performance. Such a reward would be meaningful to learners, as it symbolises their achievement and is related to their ability and effort. This is especially true in sport, where the need for regular training and practice, can easily make them appear to represent a repetitive routine. Therefore, it is necessary that positive feedback be intensified. As players and athletes acquire more skill from their repeated practice, giving them affirmative feedback about the benefits of practice will reinforce their intrinsic motivation.

Although there was no direct comparison, the results of study 1, using a monetary reward, and study 2, using positive feedback, suggest that while feedback is effective, tangible rewards can produce stronger effects on performance and intrinsic motivation. Provided they are presented in an informational manner, tangible rewards or prizes can be used by coaches and teachers to improve performance without detrimental effects on intrinsic motivation. A useful approach might be to give positive feedback regularly and tangible rewards occasionally in a variable reinforcement schedule. The present results suggest that positive effects of both can be maintained for a considerable period of the time. Similarly, removing rewards given for learning skills does not appear to lead to a reduction in performance in a context where the learners are interested in performing the skills well, that is, where intrinsic motivation is moderate to high, such as exists in many sport and exercise contexts. More research is needed to specify the most effective manner of delivering rewards, but it seems clear that, unless strong evidence is raised to the contrary, the use of rewards in teaching and coaching is supported, provided they focus on positive aspects of competence and self-determination.

9.9. Final comments

The present research involved only two studies, the first being concerned with the effect of monetary reward (performance-contingent reward) on performance, perceived competence and intrinsic motivation. The second was on the effect of positive verbal feedback on the same variables. The task was basketball free throw shooting with modified scoring conducted on Australian secondary school students aged 12 to 16 years.

The literature in this area indicated that a wide range of methodologies have been employed. Lack of clarity regarding underlying mechanisms appeared frequently in existing research. The literature review dealt with varied and sometimes contradictory findings, such as the adverse or favourable effect of reward on intrinsic motivation. For example, researchers have defined and measured intrinsic motivation operationally in different ways; Deci (1971, 1972), Lepper and Greene (1976) used free choice measures without considering the level of performance, whereas Farr (1976) and Pinder (1976) used task satisfaction; and still others used self report or volunteer rate. Recently, some researchers have used questionnaires as measuring instruments to examine intrinsic motivation. Also, Ryan, Mims and Koestner (1983) noted that various researchers have used different meanings for the same reward contingency terms. This difference in meaning sometimes caused some misunderstanding of reward contingency results.

The results of the present studies suggest that monetary reward (performance contingent) and positive verbal feedback increase performance, perceived competence and intrinsic motivation. This suggestion is supported by consistency in the results both in the immediate and the longer term retest after three weeks for both studies. The present results also indicate that removing rewards, even after a delay, need not have detrimental effects on performance, perceived competence or intrinsic motivation.

The intrinsic motivation questionnaire, was carefully modified, using alpha coefficient analyses for internal consistency, while the stability of the questionnaire was examined by test and re-test reliability. The modified IMI was further examined, using Confirmatory Factor Analysis to determine the fit to the hypothetical factor structure for intrinsic motivation of the 11 items in the study. The results of the two main studies were analysed by ANOVA, in order to determine the variation in means for performance, perceived competence and intrinsic motivation. The analysis was based on the effect of reward on each variable on the three occasions (pretest, reward test and long term test). Path analysis was also used in determining the direct and indirect effect of other variables on performance, perceived competence and intrinsic motivation as well as the relationships between extrinsic reward, performance, perceived competence and intrinsic motivation. In addition, to understand the pattern of change in the overall and partial models and how the data fit the overall model, LISREL structural equation modelling analysis was used.

Some important issues in the present thesis come from the following results: performance contingent reward increased performance, perceived competence and intrinsic motivation, and this result was maintained both in the long term and after the removal of reward. The younger students were more influenced by the extrinsic reward. It appears that the mediating effect of performance on perceived competence is strengthened when the effect of reward (positive verbal feedback) on performance is weak, whereas this factor was minimised when reward (monetary reward) strongly influenced performance. It was found, but not predicted, that the level of performance also significantly influenced intrinsic motivation. This has not been addressed in theory on extrinsic reward and intrinsic motivation.

The core of this thesis was that sport is typically a performance activity, so it is important to examine the role of performance in relation to extrinsic reward, perceived competence and intrinsic motivation. While further research is certainly needed, the present work did demonstrate that performance was intimately involved in the processes associated with offering extrinsic rewards, especially feedback or non-tangible rewards. Some clarification of the role of extrinsic reward in performance, perceived competence and intrinsic motivation in the longer term and after rewards are removed also resulted from the research conducted here. The thesis raised a number of useful points with reference to definition, measurement and analysis in the field. The work, thus, breaks new ground and provides a foundation for several new research paths in the study of extrinsic reward and intrinsic motivation.

Since sport is popular with a large section of the general population, regardless of age and gender, the results of the present thesis are crucial to the improvement of skill, performance and long-term intrinsic motivation. Therefore, future research should pay special attention to the areas and processes dealt with in this study, as well as issues not directly examined in this thesis, but raised by its findings and noted in this discussion.

References.

Abramson, L. Y, Seligman, M. E. P., & Teasdale, J. D. (1978). Learned helplessness in human: Critique and reformulation. Journal of Abnormal Psychology, 87, 49-74.

Adam, E. E. (1972). An analysis of change in performance equality with operant conditioning procedures. Journal of Applied Psychology, 56, 480-486.

Adams, J. S. (1963). Toward an understanding of inequity. Journal of Abnormal and Social Psychology, 67, 422-436.

Albu, V.M. (1990). Intercollegiate and funding. Microform publication. University of Oregon, Ore.

Alderman, R. B. & Wood, N. L. (1976). An analysis of incentive motivation in young Canadian athletes. Canadian Journal of Applied Sports Science, 1, 169-176.

Alexander, C. J., & Schuldt, W. J. (1982). Effect of achievement standards and choice on a basketball skill. Journal of Sport Psychology, 4, 189-193.

Amabile, T.M. (1983). The social psychology of creativity: Newyork: springer-verlag.

Anderson, R, Manoogian, S. T., & Reznick, J. S. (1976). The undermining and enhancing of intrinsic motivation in preschool children. Journal of Personality and Social Psychology, 34, 15-22.

Arnold, H. J. (1976). Effect of performance feedback and extrinsic reward upon high intrinsic motivation. Organisational Behaviour and Human Performance, 17, 275-288.

Atkinson, J. W. (1964). An Introduction to Motivation. New York: Van Nostrand.192-203.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behaviour change. Psychological Review, 84, 191-215.

Bandura, A., Reese, L., & Adams, N. E. (1982). Microanalysis of action and fear arousal as function of differential level of perceived self efficacy. Journal of Personality and Social Psychology, 43, 5. 21.

Bandura, A.V. (1986). Social foundation of thought an action. a social cognitive theory. Englewood Cliffs. N.J. Prentice -Hall.

Bandura, A. (1988). Social foundations of though and action; A social cognitive theory. Englewood Cliffs. U.S.A.

Bates, J.A.(1979). Extrinsic reward and intrinsic motivation: a review with implication for the classroom. Review of Educational Research. Fall, vol 49, No.4. 557-576.

Berlyne, D. E. (1966). Exploration and Curiosity. Science. 153, 25-33.

Blanck, P. D., Reis, H. T. & Jackson, L. (1984). The Effect of verbal reinforcement on intrinsic motivation for sex linked task. Sex Role. 10. 369-387.

Boggiano, A. K. & Ruble, D. N. (1979). Competence and the overjustification effect. A function of differential levels of perceived self-efficacy. Journal of Personality and Social Psychology. 37. 1462-1468.

Boggiano, A. K., Harackiewicz, J. M., Bessette, J. M., & Main, D. S. (1985). Increasing children's interest through performance contingent reward. Social Cognition. 3. no. 4. 100-411.

Brawley, L. R., & Vallerand, R. J. (1985). The effect of gender and choice on self-determination and intrinsic motivation. Unpublished manuscript. University of Waterloo.

Brewer, E. W., Dunn, J. O., & Diszewski, P. (1988). Extrinsic reward and intrinsic motivation: the vital link between classroom management and student performance. Journal of Education for teaching. 14. No2. 151-170.

Briere, N. M., Vallerand, R. J., Blais, M. R., & Pelletier, L. G. (in press). Development on validation of measure of intrinsic motivation and amotivation in sports. Journal of international sport psychology.

Bulter, R. & Nisan, M. (1986). Effect of no feedback, task-related comments, and grades on intrinsic motivation and performance. Journal of Education Psychology. 78. No 3. 210-216.

Byrne, B, M. (1989). A primer of LISREL. basic applications and programming for confirmatory factor analysis models. Springer-verge. New York.

Calder, B. J. & Staw, B. M. (1975b) Self-perception of intrinsic motivation and extrinsic motivation. Journal of Personality and Social Psychology. 31. 599-605.

Carmines, E. & McIver, J. (1981). " Analyzing model with unobsrved variables: Analysis of covariance structures" 65-115. in G, Bohrnstedt & E, Borgatta (Eds). Social Measurement: current issues. Beverly Hill.

Carone, D.P. (1975). The effect of positive verbal feedback on females intrinsic motivation. Unpublished master's thesis. University of Bridgeport.

Catano, V. M. (1975). Relation of improved performance through verbal praise to source of praise. Perceptional and Motor Skills. 42. 1283-1286.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometric. 16. 296-334.

Daniel, T. L., & Esser, J. K. (1980). Intrinsic motivation as influenced by rewards, task interest, and task structure. Journal of Applied Psychology. Vol 65. No. 5. 566-573.

deCharms, R. (1968). Personal causation: The Internal Affective Determinants of Behaviour. New York: Academic Press.

Deci, E. L. (1975). Intrinsic Motivation. New York: Plenum Press. 245-270.

Deci, E. L. Cascio, W. F. & Krusell, J. (1972). Sex differences. positive feedback and intrinsic motivation. Eastern Psychological Association. April.

Deci, E. L. (1971a). Effect of externally mediated rewards on intrinsic motivation. Journal of Personality and Social Psychology. 18. 105-115.

Deci, E. L. (1972 b). Intrinsic motivation, extrinsic reinforcement and inequity. Journal of Personality and Social Psychology. 22. 113-120.

Deci, E. L., Betely, G., Kahle, J., Abrahms, L., & Porac, J. (1981). When trying to win : Competition and in intrinsic motivation. Personality and Social Psychology Bulletin. 7. 79-83.

Deci, L. M. & Cascio, W. F. (1972, a). Changes in intrinsic motivation as function of negative feedback and threats. Paper Presented at the Meeting of Eastern Psychological Association. Boston, April.

Deci, E.L., & Ryan, R.M. (1980). The empirical exploration of intrinsic motivational processes in L. Berkowitz (Ed). Advances in experimental social psychology vol 13. Academic Press.

Deci, E. L. & Ryan, R. M. (1985). The general causality orientation scale: Self-determination in personality. Journal of Research in Personality. 109-134.

Deci, E. L., & Ryan, . M. (1989). The support of autonomy and the control of behaviour. Journal of Personality and Social Psychology, 53, 1024-1037.

Deci, E. l. & Ryan, R. M. (1991). Amotivational approach to self: Integration in personality. In R. Dientsbier (Ed.). Nebraska symposium on motivation: 38. Perspective on motivation (pp 237-288). Lincoln: Nebraska press.

Denman, L. A. & Landers, D. L. & Feltz.(1980). The effect of extrinsic reward on intrinsic interest of children involved in a motor activity. Psychology of Motor Behaviour and Sports. Roberts and Landers (Eds).

Dollinger, S. J. & Thelen, M. H. (1978). Overjustification and children intrinsic motivation: Comparative effects of four rewards. Journal of Personality and Social Psychology. 36. 1254-1269.

Dornbush, R. L. (1965). Motivation and positional cues in incidental learning. Perceptional and Motor Skills. 20. 709-714.

Douglas, A. (1993). The relationship between physical fitness, exercise intrinsic motivation. Australian Council For Health, Physical Education And Recreation. , National/International Conference (1993, Darwin)

Enzle, M. E. & Ross, J. M. (1978). Increasing and decreasing intrinsic interest with contingent reward: a test cognitive evaluation theory. Journal of Experimental Social Psychology. 14. 588-597.

Farr, J. L. (1976). Task characteristics, reward contingency, and intrinsic motivation. Organisational Behaviour and Human Performance. 16. 294-307.

Farr, J. L. Vance, R. J., & McLntre, R. M. (19770. Further Examinations of the relationship between reward contingency and intrinsic motivation. Organisational Behaviour and Human Performance. 20. 31-53.

Feingold, B. D. & Mahoney, M. J. (1975). Reinforcement Effect on intrinsic interest. undermining the overjustification hypothesis. Behaviour Therapy. 6. 367-377.

Feltz, D. L. & Petlichkoff, C. D. (1982). Perceived competence among interscholastic sport participants and dropouts. Canadian Journal of Social Science. 15. 231-235.

Festinger, L. (1957). A Theory of Cognitive Dissonance. Evanston, III. Row. Peterson.

Fisher, C. D. (1978). The effect of personal control, competence, and extrinsic reward system on intrinsic motivation. Organisational Behaviour and Human Performance, 21. 273-288.

Fitzsimmons, P. A., Landers, D. M., Thomas J. R, & Mars, H.D. (1991). Does self efficacy predict performance in experienced weight lifers?. Research Quarterly for Exercise and Sport, Vol 62. No 4. 424-431.

Foster, H. W. & Hammer, W. C. (1975). Are intrinsic and extrinsic rewards addictive. Organisational Behaviour and Human Performance.14. 398-415.

Gill, D. l. & Martens, R. (1975). The informational and motivational influence of social reinforcement on motor performance. Journal of Motor Behaviour, 7. No3. 171-182.

Glucksberg, S. (1962). The influence of strength of drive on functional fixedness and perceptual recognition. Journal of Experimental Psychology. 63. No 1. 36-41.

Gould, D. Weiss, M. & Weinberg, R. S. (1981). Psychological characteristics of successful an nonsuccessful big ten wrestlers. Journal of Sport and Exercise . 3. 69-81.

Goyen, J. D. & Lyle, J. G. (1971). Effect of incentive upon retarded and normal readers a visual-associate learning task. Journal of Experimental Child Psychology. 23. 274-280.

Granleese, J., Trew, K. & Turner, I. (1988). Sex differences in perceived competence. British Journal of Social Psychology. 27. 181-184.

Greene, D. & Lepper, M.R. (1974). Effect of extrinsic rewards on children's' subsequent intrinsic motivation. Child Development. 45. 1141-1145.

Halliwell, W. (1979). The effect of cognitive development on children's perception of intrinsically and extrinsically motivated behaviour, F. D. Larder and Christina (Eds). Psychology of Motor Behaviour and Sports 1978. Champaign III. Human Kinetics Press.

Harackiewicz, J. (1979). The effect of reward contingency and performance Feedback on intrinsic motivation. Journal of Personality and Social Psychology. 37. 1352-1363.

Harackiewicz, J. M. & Manderlink, G. (1984). A process analysis of effect of performance-contingent reward on intrinsic motivation. Journal of Experimental Social Psychology. 20. 531-551.

Harter, S. A. (1981a). A model of intrinsic mastery motivation in children: Individual difference and developmental change. Minnesota Symposium on Child Psychology.14. Hillsdale, N.J. Erlbaum.

Harter, S. (1981b). A new self- report scales of intrinsic versus extrinsic orientation in the classroom; motivational and informational competence. Developmental Psychology. *17.* 300-312.

Hebb, D. O. (1955). Drives and The C. N. S. (Conceptional Nervous System). Psychological Review. 62. 243-254.

Hendrickson, A. E. & White, P.o. (1964). Promax, aquick method for relation to oblique simple structure. British Journal of Math Statstist psychology. 17. 65-70.

Heider, F. (1958). The Psychology of Interpersonal Relation. New York. Willy.

Highlen, P. S., & Bennet, B. B. (1983). Elite divers and wrestlers: a comparison between open and closed -skill athletes. Journal of Sport psychology. 5. 390-409.

Hill, K. T. & Moley, B. E. (1969). Social reinforcement as a function of task instructions, sexes and age of experimenter on baseline performance. Journal of Experimental Child Psychology. 153-165.

Hill, K. T., & Steverson, H. W. (1965). The effect of social reinforcement versus reinforcement and sex of experimenter on performance of adolescent girl. Journal of Personality, 33. 30-36.

Horn, T. S. (1984). Expectancy effects in the interscholastic setting: methodoligical consideration. Journal of Sport Psychology. 6. 60-76.

Hunt, J. (1963) Motivation inherent in information processing and action. in O. J. Harvey (Eds). Motivation and social interaction. New York.

Iso-Ahola, S. (1977). Effect of team outcome on children's perception in little league baseball. Scandinavian Journal of Psychology.18. 38-42.

Izard, C. (1977). Human Emotions. New York. Plenum Press.

Joreskog, K. G. (1969). A general approach to confirmatory analysis. Psychometric. 34. 183-202.

Joreskog, K. G. (1977). Structural analysis of covariance a correlation matrices. Psychometrika, 43, 443-447.

Joreskog, K. G. (1986). LISREL VI: Analysis of Liner Structural relationships: 4thed. Mooresville in. Science software.

Joreskog, K. G., & Sorborn, (1989). LISREL 7. Chicago: National Education Resources.

Kamal, A. F. (1989). Extrinsic and intrinsic motivation of swimmers. International Journal of Physical Education. issue 2. 2nd quarter. 26-32.

Karniol, R. & Ross, M. (1977). The effect of performance-relevant and performance-irrelevant rewards on children's intrinsic motivation. Child Development ,48. 482-487

Kelly, H.H (1972). Causal schemata and the attribution process. New York; General learning press.

Kerlinger, F. N., & Pedhazur, E. J. (1973). Multiple regression in behavioural research. New York. Holt. Rinchart and winston.

Koestner, R., Zuckerman, M., & Koestner, J. (1987). Praise, involvement, and intrinsic motivation. Journal of Personality and Social Psychology.53. No2. 289-900.

Kruglanski, A. W., Freedman, I., & Zeevi, G. (1971). The effect of extrinsic incentive on some qualitative aspects of task performance. Journal of Personality. 39. 606-617.

Lawler, E. E., (1971). Pay and organisational effectiveness: A Psychological View. New York.

Lekco, S. J. (1990). Perceived competence and intrinsic motivation among junior tennis players. Microform Publication , Ore. 1994.

Lepper, M. R. & Greene, D. (1975). Turning play into work. Journal of Personality and Social Psychology. 31. 579-586.

Lepper, M. R., Green, D. & Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic rewards: A test of the overjustification hypothesis. Journal of Personality and Social Psychology. 28. 129-137.

Lopez, E. M. (1981). Increasing intrinsic motivation with performance-contingent reward. Journal of Psychology. 108. 54-65.

Loveland, K. K., & Olley, J. G. (1979). The effect of external reward on interest and quality of task performance in children of high and low intrinsic motivation. Child Development. 50. 1207-1210.

Luyten, H., & Lens, W. (1981). The effect of earlier experience and reward contingencies on intrinsic motivation. Motivation and Emotion. 5. 25-36.

Macy, D. J. (1973). Effect of verbal praise and reproof an balance board performance of college males and females. Perceptional and Motor Skill. 37. 488.

Markland, D. (1993). Goal-orientations, intrinsic motivation & adherence to regular physical exercise. Ph.D Thesis. Unpublished Manuscript, University of Wales, Bangor.

Markland, D., Hardy, L., & Ingledew, D. K. (1992). Confirmatory factor analysis of the intrinsic motivation inventory in Journal of Sport Science, 10. No 6. 611.

Martin, J. A. (1977). Effect of positive and negative adult-child interaction on children's task performance and task performance. Journal of Experimental Child Psychology. 23. 493-502.

Martens, L. R. (1970). Social reinforcement effect on preschool children's motor performance. Perceptual Motor Skills. 31. 789-792.

Martens, L. R. (1975). Social psychology and physical activity. New York.

Martens, L. R., Burwitz, L., & Newell, K.M. (1972). Money and praise: do they improve motor learning and performance. Research Quarterly for Exercise and Sport, 43. No 4. 429-442.

Martens, R., (1972). Social reinforcement effect on motor performance as a function of socio-economic status. Perceptional Motor Skills, 35. 215-218.

Maslow, A.H. (1970). Motivation and Personality (2nd). New York. Hamper and Row.

Mayo, R. J. (1976). The development and construct validation of a measure of intrinsic motivation. Unpublished Dissertation Prude University.

McAuley, E, Duncan, T. & Tammen, V. (1989). Psychometric properties of the intrinsic motivation inventory in a competitive sport setting: a confirmatory factor analysis. Research Quarterly for Exercise and Sport. 60. No 1. 48-58.

McCaughan, L. R. & Gimbert, B. (1981). Social reinforcement and complex motor performance expectancy, and attribution. Journal of Motor Behaviour. 13. 91-101.

McCaughan, L. R., & McKinlay, S. (1981). Effect of success/failure and extrinsic reward on intrinsic motivation using a competitive motor task. Research Quarterly for Exercise and Sport,52. No 2. 208-215.

McCelland, D. C, Atkinson, J. W., Clark, R.W., & Lowell, E.L. (1953). The achievement motive. New York: Appleton.

McGaughan, L. R., (1983). Effect of achievement motivation and susses/failure on attribution's, expectancies, and performance on a psychomotor task. Perceptual and Motor Skills. 56. 901-902.

McGraw, K. O., & McCullers, J. C. (1979). Evidence of a detrimental effect of extrinsic incentive on breaking a mental set. Journal of Experimental Social Psychology. 15. 285-294.

McGraw, K. O. (1978). The detrimental effect of reward on performance: a literature review and a prediction model. In M.R. Lepper & D. Greene (Eds). The Hidden Cost of Reward. Hillsdale N.J. Erlbaum.

Mill, L. B. & Ester, B. W. (1961). Monetary reward and motivation in discrimination learning. Journal of Experimental Psychology. 61. 501-504.

Morgan, M. (1981). The overjustification effect: a developmental test of self-perception interpretations. Journal of Personality and Social Psychology. 40. 819-821.

Murray, H.A. (1943). Thematic apperception test mannul. Cambridge. Mass: Harvard University press.

Muthen, B. (1987). LISCOMP:.. Mooresvile Analysis of liner structural relations using a comprehension measurement model. Ind. Scientific and software.

Ness, R. G. & Patton, R. W. (1979). The effect of beliefs on maximum weight lifting performance problem. Cognitive Therapy and Research, 3. 205-211.

Nicholls, J. (1984). Conceptions of ability and achievement motivation. in R. Adams & C. Ames (Eds). Vol 1. New York.

Nicholls, J. G. (1978). The development of the concepts of effort and ability, perceptions of own attainment, an understanding that difficult task require more ability. Child Development. 49. 800-814.

Nicholls, J. (1984a). Achievement motivation: Conception of ability, subjective experience, task choice & performance. Psychological Review, 91, 328-346.

Notz, w. w. (1975). Work motivation and the negative effect of extrinsic rewards. American Psychologist. 30. 884-881.

Orlick, T. D. & R. Mosher. (1978). Extrinsic rewards and participant motivation in sports related task. The International Sport Psychology 9. 27-39.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., & Briere, N. M. (1995). Toward a New measure of intrinsic motivation, extrinsic motivation and amotivation in sports: The Sport Motivation Scale (SMS). Journal of Sport & Exercise Psychology, 7, 38-53.

Philps, B. W. & Lord, R. G. (1980). Determinants of intrinsic motivation: locus of control and competence as components of Deci's cognitive evaluation theory. Journal of Applied Psychology. 65. 211-218.

Piaget, J. (1952). The origans of intelligence in children. New York International university press.

Pinder, C. C. (1976). Additively versus non additively of interest and extrinsic incentives: implication for theory and practice. Journal of Applied Psychology. 61. 693-700.

Pittman, T. S. & Swann, W. B. (1977). Initiating play activity of children: the moderating influence of verbal cues on intrinsic motivation. Child Development. 48. 1128-1132.

Plant, R., & Ryan R. M. (1985). Self-consciousness, self-awareness ego-involvement, and intrinsic motivation: on investigation of internally controlling styles. Journal of Personality. 53. 435-444.

Pretty, G. N., & Seligman. C. (1984). Affect and the overjustification effect. Journal of Personality and Social Psychology. 46. 1241-1253.

Pritchard, R. D., Compbell, K. M., & Compbell, D. J. (1977). Effect of extrinsic financial rewards on intrinsic motivation. Journal of Applied Psychology. 62. 9-15.1

Reeve, J., (1989). The interest-enjoyment distinction in intrinsic motivation. Motivation and Emotion. 13. No 2. 83-103.

Reiss, S., & Susshinsky, L. W., (1975). Overjustification, competing responses, and the acquisition of intrinsic motivation. Journal of Personality and Social Psychology. 31. 1116-1125.

Reiss, S. & Suchinsky, L. W. (1976). The competing response hypothesis of decreased play effects: a relay to Lepper and Greene. Journal of Personality and Social Psychology. 33. No2. 233-244.

Roberts, G. C. & Martens, R. (1970). Social reinforcement and complex motor performance. Research Quarterly. 41. 175-181.

Rosenfield, D., Folger, R. & Adelman, H. (1980). When reward reflect competence: a qualification of the overjustification effect. Journal of Personality and Social Psychology. 39. 368-376.

Ross, M. (1975). Salience of reward and intrinsic motivation. Journal of Personality and Social Psychology. 32. 245-254.

Ross, M., Karniol, R., & Rothstein, M. (1976). Reward contingency and intrinsic motivation in children: a test of the delay of gratification hypothesis. Journal of Personality and Social Psychology. 32. 245-254.

Rushall, B. S., & Pettinger, J. (1969). An evaluation of the effect of various reinforce used as motivates in swimming. The Research Quarterly. 40. No3. 540-545.

Ryan, E. D., (1977). Attribution, intrinsic motivation, and athletics. in L.I. Gredvilas and M.E. Kneer (Eds.). proceedings of the national physical education association for men/ national association for physical education of college women, national conference. Chicane: office of publications services. University of Illinios at chicane circle.

Ryan, R. M., & Deci, E. L. (1984). Intrinsic motivation in Sport: A cognitive evaluation theory interpretation: In Straub, W. F., & J. M., Williams (eds.). Cognitive sport psychology. Sport science association 231-142.

Ryan, R. M. & Mims and Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation. A review and test using cognitive evaluation theory. Journal of Personality and Social Psychology. 45. 736-750.

Ryan, E. D. (1979). Attribution, intrinsic motivation, and athletics. A replication and theory. Journal of Personality and Social Psychology. 45. 736-750. Nadeau. W.R.

Sarris, W. E., & Strongkhorst. (1981). Causal modelling in nonexperimental research. Amsterdam. Netheranda.

Schunk, D. H. (1983) Reward contingencies and development of children's skill and self-efficacy. Journal of Education Psychology.75. 511-518.

Skinner, B. F., (1953). Science and Human Behaviour, New York.

Slanck, G. R., (1975). Increasing effect of performance and money on self-perception of intrinsic motivation. Organisational Behaviour and Human Performance. 13-14. 339-351.

Smith, M. C. (1975). Children's use of the multiple sufficient cause-schema in social perception. Journal of Personality and Social Psychology. 32. 737-747.

Smith, W. E. (1974). The effect of social and monetary rewards on intrinsic motivation. Unpublished Doctoral Dissertation. Cornell University, Ithaca N.Y.

Sohi, A. S. (1976). Effect of reinforcement as motivational technique on level of aspiration and motor performance. International Journal of Sport Psychology. 7. 113-119.

Staw, B. M. (1974). Attitudinal and behavioural consequences of changing a major organisational reward. Journal of Personality and Social Psychology. 29. No 6. 742-751.

Stock, C. G. (1978). Effect of praise and its source on performance. Perceptual and Motor Skills. 47. 43-46.

Swann, W. B.& Pittman, J. S. (1977). Initiating play activity of children. Child Development. 48. 1128-1132.

Thiffault, C. (1980). Construction of validation of measure. de la rapidity de persee tactique des jounior de hockey sus galce. in .C.H. Nadeau, W.R. Halliwell, K. Newell, G.C. Roberts. (Eds). Psychology of Motor Behaviour and Sport -1979. Champaign. I.L. Human Kinesthetics. 1980.

Thomas, J. R. & Tennant, L. K. (1978). Effect of rewards on children's motivation for an athletic task. In F.L. Small and R.E. Smith, Psychological Perspective's in Youth Sports. Washington, D.C. Hemisphere Publishing.

Torrance, A.E., & Templeton, O. E. (19630. Minnesta Tests for creative thinking. Minnepolis: University of Minnesota press.

Vallerand, R. J. (1987). On the motivational effects of positive verbal reinforcement on performance: toward an Inverted-U relationship. Motivation and Emotion.

Vallerand, R. J., & Reid, G. (1984). On the causal effect of perceived competence on intrinsic motivation. A test of Cognitive Evaluation Theory. Journal of Sport Psychology. 6. 94-102.

Vallerand, R. J. (1983). Effect of differential amounts of positive verbal feedback on the intrinsic motivation of male hockey player. Journal of Sport Psychology. 5. 100-107.

Vallerand, R. J., & Blais, M. R. (1986). A cognition-affect-intrinsic motivation model; an extension of cognitive evaluation theory's perceived competence process. Unpublished manuscript. University of Quebec at Monteral.

Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic , extrinsic, and amotivational styles as predictors of behaviour. A prospective study: Journal of Personality, 69, 599-620.

Vallerand, R. J., & Brawley, L. (1983). Self-determination and intrinsic motivation: a look at outcomes and processes. Unpublished manuscript. University of Quebee of Montreal.

Vallerand, R. J., Deci, E. L., & Ryan, R. M. (1987). Intrinsic motivation in sport. Exercise & Sport Science Review, 15. In K>B Pandolf (eds.)

Vallerand, R. J. & Reid, G., (1988). On the relative effect of positive and negative verbal feedback on males' and females' intrinsic motivation. Canadian Journal of Behaviour Science. 20. 239-250.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C. & Vallies, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic and amotivation in educational and Psychological Measurement, 52, 1003-1017.

Wankel, L. M., & Kreisel, P. (1982). An investigation of factor influencing sport enjoyment across sport and age groups. Paper presented at the North American Society for Psychology of Sport and Physical Activity conference.

Wankel, L. M., & Pabich, P. (1982). The minor sport experience: factor contributing to or detracting from enjoyment. unpublished manuscript. University of Alberta. Edmonton.

Weinberg, R. S. (1984). The relationship between extrinsic motivation and intrinsic motivation in sport. Fa Silva J.M. III & Weinberg, R.S. (Eds).

Psychological Foundation of Sport. Champaign, Illinios: Human Kinetics, pp171-229.

Weinberg, R. S., Gould, g. & Jackson, A. (19790. Expectations and performance: An empirical test of Bandura's self-efficacy theory. Journal of Sport Psychology, 1, 320-331.

Weinberg, R. & Ragan, J. (1979). Effect of competition, success/failure, and sex on intrinsic motivation. Research Quarterly. 50. 503-510.

Weinberg, R.S. & Jackson, A. (1979). Competition and extrinsic rewards: effect on intrinsic motivation and attribution. Research Quarterly. 50. 494-502

Weiner, M. J. & Mander, A. M. (1978). The effect of reward and perception of competency upon intrinsic motivation. Motivation and Emotion. 2. 67-73.

Weiss, M. R., Bredermeier, B. J. & Schwchuk, R. M. (1985). An intrinsic/extrinsic motivation scale for the youth sport setting: a confirmatory factor analysis: Journal of Sport Psychology. 7. 75-91.

Wheaton, b., Muthen, B., Alwin, D., & Summers, G. (1977) "Assesing reliability and saability in panel model" 84-136. in D, Heise (Ed). Sociological Methodlogy. San Francisco. Jossey-Bass.

White, R. W. (1959). Motivation Reconsidered: The Concept of Competence. Psychological Review. 66. 297-333.

Whitehead, J. R., & Corbin, C. B., (1991). Youth fitness testing: the effect of percentile-based evaluate feedback on intrinsic motivation. Research Quarterly for Exercise and Sport. 62.

Woodcock, A. J., & Corbin, C. B. (1992). The effect of verbal feedback on intrinsic motivation and perceived competence of cricketers. The Australian Journal of Science and Medicine in Sport. December. vol24, no4. 94-97.

Woodworth, R. S. (1958). Dynamic of Behaviour. New York. Holt. No2. 225-231.

Zinser, O., Young, J.G. & King, P.E. (1982). The influence of verbal reward on intrinsic motivation in children. Journal of General Psychology. 51. 43-46.

List of Appendices

* This data is unavailable because the diskette containing the data was physically damaged.

Appendix 1 Instructions for basketball shooting test

INSTRUCTIONS FOR PRE-TEST

1. Welcome to the Experiment

"Thank you for volunteering to take part in this study. You can stop at any time, if you are not happy. Please try as hard as you can at all times. Also, answer the questions honestly. Don't try to think what anybody else might say or do, just do your best and answer how you feel."

2. Explanation of the Subject's Role

"You will be asked to do a basketball shooting task, which is interesting. Then you will be asked to answer some questions about the task, especially about how you felt."

3. Detailed Explanation of the Task.

"Please come and stand on this line, facing the basketball basket. The task is to throw or shoot basketballs at the basket. Try to get them through the basket without touching the ring or the board at the back. Every ball that goes through the basket will count. You may shoot in any way you feel is easiest, with one or two hands, under or overarm, for example. Have you any questions?..............

Now you will have four (4) practice shots to get an idea of how it feels to throw at the basket. These shots don't count.

SUBJECT DOES 4 PRACTICE SHOTS

Are you ready?............... Any final questions?...................

Now we will begin counting. You have twenty shots. Try as hard as you can on every one. Go.

SUBJECT DOES 20 SHOTS AND THESE ARE SCORED

Well done. You scored X out of twenty baskets."

4. Intrinsic Motivation and Perceived Competence

"Now please answer the twelve questions on the sheet of paper in front of you. The first question is about how you good you feel you are at the task. Answer this by circling one number from 1 to 7. Number 1 means you think you are extremely good indeed, number 2 means that you think you are very good, and so on to number seven which means you think you are not good at the task at all. ("How good do you think you are at the basketball shooting task?")

The other 11 questions ask you how you feel about doing the basketball shooting. For each one, cicle one of the seven numbers. Here the number 1 means you very strongly disagree with the statement, number two means you strongly disagree, and so on up to number 7 which means you very strongly agree. Please read the words in each question very carefully before answering. Make sure you answer EVERY question. If you do not understand any questions please ask me.

SUBJECT COMPLETES QUESTIONNAIRE

Thank you for taking part in this study. Your work has helped me a lot."

The items of the IMI for internal consistency study 1

QUESTIONNAIRES FOR INTRINSIC MOTIVATION

AGE ________ SEX: M ________ F ________ DATE ________

The following questionnaires are designed to assess your feeling about your personal involvement with basketball shooting for sporting performance. Please circle a number from 1 to 7 to indicate your level of agreement with each of the statements. *Rating scale:* The numbers are interpreted as follows: 1, very strongly disagree; 2, strongly disagree; 3, disagree; 4, neither agree nor disagree; 5, agree; 6, strongly agree; 7, very strongly agree.

1. I enjoyed doing basketball shooting just for the fun of it.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
2. I think I am pretty good at basketball shooting.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
3. I made a lot of effort in basketball shooting.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
4. I felt tense while doing basketball shooting.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
5. I would describe basketball shooting as very interesting.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
6. After doing basketball shooting for a while I felt pretty competent.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
7. It was meaningful to me to do well at basketball shooting.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
8. I felt pressured while doing basketball shooting.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
9. Doing basketball shooting was fun.
   1 2 3 4 5 6 7
   very strongly disagree — very strongly agree
10. I tried very hard while doing basketball shooting.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree
11. I was very relaxed while doing basketball shooting.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree
12. This basketball shooting did not hold my attention.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree
13. I am pretty skilled at doing basketball shooting.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree
14. I did not try very hard at doing basketball shooting.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree
15. I was anxious while doing basketball shooting.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree
16. I could not do basketball shooting very well.
    1 2 3 4 5 6 7
    very strongly disagree — very strongly agree

Thank you for your co-operation.

Appendix 4 The items of IMI for internal consistency 3

Appendix: Questionnaire 3

QUESTIONNAIRES FOR INTRINSIC MOTIVATION

AGE ______________ SEX: M ______________ F ___________

This questionnaire is designed to assess your feelings about your basketball shooting. For each statement please circle a number from 1 to 7 to indicate your level of agreement with that statement.

	Very strongly disagree	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Very strongly agree
1. I enjoyed doing the basketball shooting.	1	2	3	4	5	6	7
2. I think I am good at basketball shooting.	1	2	3	4	5	6	7
3. I made a lot of effort in basketball shooting.	1	2	3	4	5	6	7
4. I thought basketball shooting was interesting.	1	2	3	4	5	6	7
5. After doing the basketball shooting for a while I felt pretty skilfull.	1	2	3	4	5	6	7
6. It was important to me to do well at basketball shooting.	1	2	3	4	5	6	7
7. Doing basketball shooting was fun.	1	2	3	4	5	6	7
8. I tried very hard at doing basketball shooting.	1	2	3	4	5	6	7
9. This basketball shooting activity was enjoyable.	1	2	3	4	5	6	7
10. I am quite skilled at doing basketball shooting.	1	2	3	4	5	6	7
11. I tried to do my best at basketball shooting.	1	2	3	4	5	6	7
12. I could do the basketball shooting well.	1	2	3	4	5	6	7

Please check that you have circled one number for each statement.

Thank you for your co-operation.

Appendix 5 The items of IMI for internal consistency study 4

Appendix: Questionnaire 4

QUESTIONNAIRE FOR INTRINSIC MOTIVATION

NAME ____

AGE ____________________ years SEX: M __________ F __________

How good do you think you are at the basketball shooting task?

Please circle a number from 1 to 7 which experience your feelings.

1	2	3	4	5	6	7
Very poor	Poor	Below average	Average	Good	Very good	Extremely good

This questionnaire is designed to assess your feelings about your basketball shooting. For each statement please circle the number from 1 to 7 which indicates your level of agreement with that statement.

	Very strongly disagree	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Very strongly agree
1. I enjoyed doing basketball shooting.	1	2	3	4	5	6	7
2. I think I am good at basketball shooting.	1	2	3	4	5	6	7
3. I thought basketball shooting was interesting.	1	2	3	4	5	6	7
4. After doing the basketball shooting for a while I felt pretty skilfull.	1	2	3	4	5	6	7
5. It was important to me to do well at basketball shooting.	1	2	3	4	5	6	7
6. Doing basketball shooting was fun.	1	2	3	4	5	6	7
7. I tried hard at doing basketball shooting.	1	2	3	4	5	6	7
8. This basketball shooting activity was enjoyable.	1	2	3	4	5	6	7
9. I am quite skilled at doing basketball shooting.	1	2	3	4	5	6	7
10. I tried to do my best at basketball shooting.	1	2	3	4	5	6	7
11. I could do the basketball shooting well.	1	2	3	4	5	6	7

Please check that you have circled one number for each statement.

Thank you for your co-operation.

Appendix - Questionnaire 1 - Raw Data

UBJEC	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15	Q16
3001	6	5	6	2	7	4	6	1	7	6	6	1	6	1	4	1
3002	4	2	7	7	7	7	7	4	7	7	4	7	1	7	7	4
3003	7	5	3	1	6	6	4	1	7	7	1	4	4	4	1	7
3004	6	2	5	1	4	3	5	1	7	5	1	4	1	5	5	2
3005	5	4	5	5	3	5	3	5	5	4	5	5	3	3	5	5
3006	5	4	5	3	5	5	3	5	5	4	5	5	3	3	5	5
3007	7	7	5	5	5	4	4	7	7	3	2	5	1	2	7	5
3008	2	2	1	4	3	6	3	2	4	3	6	3	4	3	7	1
3009	7	5	2	4	4	6	2	5	7	5	5	4	5	7	7	7
3010	7	7	7	1	5	7	1	1	4	7	6	7	6	4	4	6
3011	5	4	3	4	3	3	3	7	4	7	1	1	3	3	3	3
3012	3	6	7	3	3	7	6	4	7	6	4	4	3	3	4	3
3013	3	6	3	3	3	3	5	4	3	5	5	1	5	3	5	7
3014	3	4	6	4	3	5	2	5	3	6	3	5	3	4	4	5
3015	6	4	5	2	6	2	5	2	6	6	6	2	4	2	5	6
3016	4	1	3	4	5	5	4	2	6	5	4	4	4	7	4	4
3017	5	4	3	4	3	3	3	7	4	7	1	1	3	3	3	3
3018	6	4	5	2	5	5	5	4	5	6	7	1	4	3	5	6
3019	6	4	5	2	5	4	4	2	7	4	4	1	1	5	6	4
3020	7	7	7	1	7	7	7	1	7	6	1	7	6	7	6	7
3021	7	5	4	2	7	5	7	4	7	5	4	7	4	7	7	5
3022	7	4	4	7	5	5	3	7	7	4	7	4	7	1	7	4
3023	6	4	5	4	5	5	6	5	7	1	5	5	2	2	2	2
3024	4	4	3	3	4	4	4	3	3	4	2	3	5	7	3	4
3025	5	4	3	4	5	4	4	3	6	4	4	4	4	3	4	4
3026	5	4	4	3	3	3	3	3	4	3	4	4	3	4	4	3
3027	5	3	6	3	5	5	5	3	5	5	5	5	4	3	5	4
3028	7	7	3	3	7	7	7	7	7	3	7	7	7	7	7	3
3029	3	7	7	7	3	7	3	7	3	4	5	7	6	5	4	7
3030	7	7	3	5	5	5	6	5	5	5	3	4	6	3	5	3
3031	6	5	7	3	5	5	6	4	7	7	3	2	7	4	5	6
3032	7	7	5	2	4	7	5	3	7	6	1	1	3	4	1	2
3033	5	5	6	6	1	3	5	6	7	6	7	7	7	7	5	1
3034	4	2	3	4	5	6	3	2	5	2	5	3	7	6	2	4
3035	4	2	2	3	5	4	2	7	7	3	4	3	2	3	1	2
3036	7	3	3	4	4	3	7	4	7	4	4	4	3	4	3	4
3037	5	2	5	5	3	5	2	5	7	6	5	5	2	2	7	7
3038	3	2	4	5	4	4	4	4	4	4	3	5	3	4	4	5
3039	7	4	6	2	6	7	6	1	7	7	7	1	4	5	5	5
3040	1	2	1	1	2	5	1	4	7	7	2	3	1	5	5	3
3041	6	4	6	2	5	4	4	3	4	4	5	3	4	4	4	3
3042	3	4	5	2	5	4	5	1	6	5	5	4	4	2	3	4
3043	4	2	5	4	5	5	5	3	6	5	3	4	3	3	4	5
3044	4	4	3	2	3	3	3	1	7	3	3	6	2	3	4	3
3045	6	4	5	4	5	6	6	2	7	5	4	5	4	5	3	4
3046	5	5	4	1	5	6	5	1	6	5	7	1	5	3	4	5
3047	5	1	6	2	5	4	6	2	7	7	5	1	1	1	2	4
3048	5	3	4	3	4	4	4	3	5	4	4	3	3	5	3	3
3049	2	2	3	5	4	3	4	3	4	3	3	4	3	2	3	2
3050	2	1	1	2	3	3	3	3	2	7	7	5	3	3	4	3
3051	7	5	7	6	4	7	6	7	6	5	6	5	5	7	7	6
3052	7	5	7	5	6	7	7	5	7	7	1	7	2	7	1	7
3053	3	3	3	3	3	3	4	7	7	5	6	4	7	7	1	7
3054	7	3	6	3	3	7	3	7	7	7	6	7	3	3	5	7
3055	3	3	7	7	1	7	7	7	4	7	5	3	3	3	3	3
3056	7	7	6	6	4	6	7	4	6	6	4	6	5	6	4	6
3057	5	7	7	2	7	7	7	6	7	7	6	7	7	7	1	7
3058	6	5	5	4	6	6	4	2	7	7	1	7	5	7	1	4
3059	6	2	6	4	5	5	4	6	7	7	7	3	4	7	4	7
3060	7	6	6	7	7	7	7	7	7	7	7	7	4	4	5	4
3061	6	5	4	5	5	4	5	3	6	5	4	4	5	4	4	5
3062	7	7	5	7	7	5	7	4	7	7	4	2	5	1	4	2
3063	2	2	7	2	4	1	2	1	2	5	2	2	1	2	1	1
3064	7	7	7	7	7	1	6	5	7	7	5	7	7	3	2	1
3065	7	6	6	7	6	7	6	7	6	7	6	7	6	7	6	7
3066	7	6	7	4	6	7	6	7	6	7	6	2	7	7	2	6
3067	7	3	7	5	6	6	7	7	7	7	6	4	5	4	5	6
3068	7	7	7	7	3	7	4	7	7	7	6	1	4	2	6	7
3069	7	7	7	2	7	7	2	1	7	7	7	1	7	1	1	1
3070	1	4	2	1	2	1	3	1	1	3	1	2	7	7	1	7
3071	7	5	4	1	6	3	1	6	7	3	5	1	7	4	4	1
3072	7	3	3	5	7	7	7	5	7	7	6	6	5	1	5	5
3073	7	6	6	1	7	6	6	1	7	1	7	1	7	5	1	3
3074	6	4	7	7	4	6	6	7	5	7	2	7	5	2	3	4
3075	7	5	6	7	3	6	7	4	7	7	6	4	5	5	4	4
3076	7	6	5	1	7	7	7	6	7	5	6	7	6	2	4	1
3077	5	2	3	2	3	2	3	3	4	3	2	3	2	7	7	7
3078	5	6	7	1	4	6	5	3	3	7	4	4	5	7	7	7
3079	5	4	4	3	4	5	4	2	5	5	4	4	4	4	4	3
3080	7	4	7	7	7	6	6	6	7	1	3	5	5	6	6	1
3081	7	6	7	7	7	7	7	6	7	7	5	7	7	7	6	3
3082	7	6	7	6	6	7	7	7	7	7	7	7	7	6	1	7
3083	5	5	6	6	5	5	5	6	7	5	6	5	5	5	5	5
3084	6	1	4	4	7	5	4	4	7	5	7	1	4	6	3	5
3085	1	4	5	6	7	3	4	6	3	2	3	4	2	6	4	2
3086	4	1	5	3	2	7	6	4	7	7	7	1	5	3	4	4
3087	7	6	6	7	5	6	6	5	7	6	3	2	7	4	7	7
3088	5	5	3	3	6	5	5	4	6	3	3	2	5	2	3	7
3089	7	5	5	5	6	5	5	7	7	7	5	3	5	3	5	3
3090	5	3	5	4	3	4	4	4	4	4	4	4	3	3	3	5
3091	3	1	4	4	3	3	3	4	4	5	4	4	1	4	3	1
3092	7	3	4	5	4	4	5	5	7	7	5	5	6	1	4	3
3093	7	4	6	1	7	7	4	4	7	5	3	1	2	3	4	7

Appendix 7 The raw data for internal consistency study 4

BJECT	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11
4001	6	4	6	4	4	5	5	5	4	5	5
4002	6	6	6	5	6	5	6	6	5	6	4
4003	5	4	4	5	4	5	5	6	6	4	6
4004	5	3	5	2	4	4	4	5	3	5	3
4005	6	4	5	5	5	6	5	5	5	5	5
4006	5	4	6	3	5	4	5	4	2	5	3
4007	5	4	6	4	6	6	6	5	5	6	4
4008	6	6	5	6	5	6	4	6	6	5	5
4009	6	7	6	7	6	5	7	5	6	7	6
4010	5	4	5	5	4	6	4	6	5	4	5
4011	6	4	6	4	5	4	5	5	4	6	5
4012	6	6	6	7	5	5	5	6	7	5	7
4013	6	7	6	6	7	7	7	6	6	7	5
4014	6	4	6	4	4	6	4	5	4	4	5
4015	7	6	6	6	6	5	6	5	5	7	5
4016	6	7	6	7	5	5	5	5	7	5	7
4017	6	5	7	5	7	6	5	6	6	6	6
4018	7	6	6	5	6	7	6	7	5	5	5
4019	7	4	4	5	5	6	6	5	5	6	5
4020	6	6	5	6	4	7	5	6	6	5	6
4021	6	6	5	6	4	7	5	6	6	5	6
4022	6	4	4	5	5	6	6	5	5	6	5
4023	6	6	6	5	6	7	6	7	5	5	5
4024	6	5	7	5	7	6	5	6	6	6	6
4025	7	7	6	7	5	5	5	5	7	5	7
4026	6	6	6	6	6	5	6	5	5	7	5
4027	6	4	6	4	4	6	4	5	4	4	5
4028	7	7	6	6	7	7	7	6	6	7	5
4029	6	6	6	7	5	5	5	6	7	5	7
4030	6	4	6	4	5	4	5	5	4	6	5
4031	5	4	5	5	4	6	4	6	5	4	5
4032	6	7	6	7	6	5	6	5	6	7	6
4033	6	6	5	6	6	4	4	6	6	5	6
4034	5	3	5	2	5	4	5	5	3	5	3
4035	6	6	6	5	6	6	6	6	5	6	4
4036	5	4	6	4	5	5	5	4	5	5	5
4037	5	3	5	2	4	4	4	5	3	5	4
4038	7	7	6	7	5	4	5	5	7	5	7
4039	5	4	5	5	4	5	4	6	5	4	5
4040	5	4	6	3	5	4	5	4	2	5	4
4041	6	6	6	6	5	6	5	5	5	7	5
4042	6	4	5	4	5	4	5	5	4	5	6
4043	6	6	6	7	5	5	5	6	7	5	7
4044	6	4	6	4	4	6	4	5	4	4	5
4045	4	6	4	6	6	6	6	5	5	6	4
4046	6	5	7	5	7	6	5	6	6	6	6
4047	6	4	6	4	4	6	4	5	4	4	5
4048	6	4	5	5	4	6	5	5	4	5	6
4049	5	4	4	5	4	6	5	5	6	6	4
4050	5	4	6	4	6	6	6	5	5	6	4
4051	5	3	5	4	4	4	3	5	3	5	4
4052	5	4	4	5	4	6	6	5	5	6	4
4053	6	4	4	5	5	6	6	5	5	6	5
4054	5	4	6	4	5	6	6	5	5	6	4
4055	6	6	6	7	5	5	5	7	6	5	7
4056	5	4	5	5	4	6	5	5	5	5	4
4057	5	3	5	4	5	4	5	5	4	5	6
4058	6	4	6	4	5	4	5	5	4	6	5
4059	5	4	4	5	5	6	4	5	4	4	5
4060	5	4	5	5	4	6	4	6	5	4	5
4061	5	4	4	5	4	5	5	6	6	4	6
4062	5	4	5	4	6	6	6	5	6	5	5
4063	6	4	6	4	5	4	5	5	4	6	5
4064	6	6	6	6	5	6	5	5	5	7	5
4065	4	6	4	6	6	6	6	5	5	6	4
4066	6	5	7	5	6	6	5	6	5	6	5
4067	5	4	4	5	4	6	5	5	6	6	4
4068	5	3	5	4	4	4	3	5	3	5	4
4069	5	3	5	5	4	5	4	5	3	6	5
4070	5	4	6	4	5	6	6	5	5	6	4
4071	5	4	5	5	4	6	5	6	5	5	4
4072	5	4	4	5	5	6	4	5	4	4	6
4073	5	3	5	4	5	4	5	5	4	5	6
4074	5	4	5	5	4	6	4	6	4	6	5
4075	6	6	5	6	5	4	4	5	6	5	6
4076	5	3	5	4	5	2	5	5	3	5	3
4077	6	5	7	5	7	6	5	6	6	6	6
4078	5	3	5	5	4	4	3	5	3	5	4
4079	6	4	6	4	5	3	5	5	4	6	5
4080	5	3	5	2	4	4	4	5	3	5	4

Appendix 8 Results for internal consistency study 1

SAS 13:39 Friday, May 31, 1991

CORRELATION ANALYSIS

16 'VAR' Variables: Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16

Simple Statistics

Variable	N	Mean	Std Dev	Sum
Q1	93	5.38710	1.71966	501.00000
Q2	93	4.24731	1.76719	395.00000
Q3	93	4.94624	1.65743	460.00000
Q4	93	3.80645	1.91253	354.00000
Q5	93	4.78495	1.59380	445.00000
Q6	93	5.13978	1.59204	478.00000
Q7	93	4.73118	1.69488	440.00000
Q8	93	4.08602	2.05181	380.00000
Q9	93	5.89247	1.52844	548.00000
Q10	93	5.25806	1.66095	489.00000
Q11	93	4.48387	1.81547	417.00000
Q12	93	3.96774	2.05072	369.00000
Q13	93	4.31183	1.82363	401.00000
Q14	93	4.13978	1.95932	385.00000
Q15	93	4.06452	1.81064	378.00000
Q16	93	4.22581	1.96230	393.00000

Cronbach Coefficient Alpha

for RAW variables : 0.788378
for STANDARDIZED variables: 0.790051

Deleted Variable	Raw Variables: Correlation with Total	Raw Variables: Alpha	Std. Variables: Correlation with Total	Std. Variables: Alpha	Label
Q1 I	0.585145	0.756407	0.607286	0.762031	interest
Q2 C	0.482876	0.764053	0.490562	0.771142	competent
Q3 E	0.477813	0.765040	0.486666	0.771442	effort
Q4 Compet	0.366630	0.773182	0.351099	0.781688	tension/pressure
Q5 I	0.353549	0.774062	0.369692	0.780303	interest
Q6 C	0.516025	0.762751	0.520281	0.768347	competent
Q7 E (Wording)	0.522467	0.761456	0.535529	0.767663	effort
Q8 Compet	0.424705	0.768335	0.410266	0.777258	tension/pressure
Q9 I	0.415003	0.770090	0.431288	0.775669	interest
Q10 E	0.327191	0.775894	0.332574	0.783061	effort
Q11 Compet	0.255304	0.781665	0.263283	0.788141	tension/pressure
Q12 E (Wording)	0.338853	0.775970	0.328164	0.783387	interest
Q13 Compet	0.428556	0.768159	0.432102	0.775607	competent
Q14 E (rve)	0.204860	0.786657	0.193701	0.793154	effort
Q15 Compet	0.202895	0.785592	0.193813	0.793146	tension/pressure
Q16 C (+ve)	0.251354	0.782893	0.246788	0.789338	interest

SAS

CORRELATION ANALYSIS

16 'VAR' Variables: Q1 Q2 Q3 Q4 Q5 Q6
Q7 Q8 Q9 Q10 Q11 Q12
Q13 Q14 Q15 Q16

Simple Statistics

Variable	N	Mean	Std Dev	Sum
Q1	93	5.38710	1.71966	501.00000
Q2	93	4.24731	1.76719	395.00000
Q3	93	4.94624	1.65743	460.00000
Q4	93	3.80645	1.91253	354.00000
Q5	93	4.78495	1.59380	445.00000
Q6	93	5.13978	1.59204	478.00000
Q7	93	4.73118	1.69488	440.00000
Q8	93	4.08602	2.05181	380.00000
Q9	93	5.89247	1.52844	548.00000
Q10	93	5.25806	1.66095	489.00000
Q11	93	4.48387	1.81547	417.00000
Q12	93	3.96774	2.05072	369.00000
Q13	93	4.31183	1.82363	401.00000
Q14	93	4.13978	1.95932	385.00000
Q15	93	4.06452	1.81064	378.00000
Q16	93	4.22581	1.96230	393.00000

Cronbach Coefficient Alpha

for RAW variables : 0.783378
for STANDARDIZED variables : 0.790051

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
Q1	0.585145	0.756407	0.607286	0.762031	interest
Q2	0.482876	0.764053	0.490562	0.771142	compentent
Q3	0.477813	0.765040	0.486666	0.771442	effort
Q4	0.366630	0.773182	0.351099	0.781688	tension/pressure
Q5	0.353549	0.774062	0.369692	0.780303	interest
Q6	0.516025	0.762751	0.520281	0.768847	compentent
Q7	0.522467	0.761456	0.535529	0.767663	effort
Q8	0.424705	0.768335	0.410266	0.777258	tension/pressure
Q9	0.415003	0.770090	0.431288	0.775669	interest
Q10	0.327191	0.775894	0.332574	0.783061	compentent
Q11	0.255304	0.781665	0.263283	0.788141	effort
Q12	0.338853	0.775970	0.328164	0.783387	tension/pressure
Q13	0.428556	0.768159	0.432102	0.775607	interest
Q14	0.204860	0.786657	0.193701	0.793154	compentent
Q15	0.202895	0.785592	0.193813	0.793146	effort
Q16	0.251354	0.782893	0.246788	0.789338	tension/pressure

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	93	5.38710	1.71966	501.00000
VAR2	93	4.78495	1.59380	445.00000
VAR3	93	5.89247	1.52844	548.00000
VAR4	93	3.96774	2.05072	369.00000

Cronbach Coefficient Alpha

for RAW variables : 0.618148
for STANDARDIZED variables : 0.650380

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.586941	0.399938	0.624977	0.437797	Q1 Interest
VAR2	0.478259	0.494225	0.497151	0.534810	Q5
VAR3	0.512030	0.475660	0.535372	0.506671	Q9
VAR4	0.125476	0.773311	0.124558	0.772957	Q12

Pearson Correlation Coefficients / Prob > IRI under Ho: Rho = 0 / N = 93

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.53040	0.63219	0.12379
Q1 Interest	0.0	0.0001	0.0001	0.2371
VAR2	0.53040	1.00000	0.43214	0.11092
Q5	0.0001	0.0	0.0001	0.2898
VAR3	0.63219	0.43214	1.00000	0.07517
Q9	0.0001	0.0001	0.0	0.4739
VAR4	0.12379	0.11092	0.07517	1.00000
Q12	0.2371	0.2898	0.4739	0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	93	3.80645	1.91253	354.00000
VAR2	93	4.08602	2.05181	380.00000
VAR3	93	4.48387	1.81547	417.00000
VAR4	93	4.06452	1.81064	378.00000

Cronbach Coefficient Alpha

for RAW variables : 0.593003
for STANDARDIZED variables : 0.585291

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.485770	0.430542	0.469340	0.429815	Q4 Tension
VAR2	0.526924	0.385786	0.520209	0.385812	Q8
VAR3	0.227284	0.624965	0.226869	0.617439	Q11
VAR4	0.274932	0.592617	0.274930	0.583721	Q15

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 93

	VAR1	VAR2	VAR3	VAR4
VAR1 Q4 Tension	1.00000 0.0	0.60536 0.0001	0.13683 0.1909	0.22023 0.0339
VAR2 Q8	0.60536 0.0001	1.00000 0.0	0.21339 0.0400	0.22670 0.289
VAR3 Q11	0.13683 0.1909	0.21339 0.0400	1.00000 0.0	0.16235 0.1200
VAR4 Q15	0.22023 0.0339	0.22670 0.0289	0.16235 0.1200	1.00000 0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	93	4.94624	1.65743	460.00000
VAR2	93	4.73118	1.69488	440.00000
VAR3	93	5.25806	1.66095	489.00000
VAR4	93	4.13978	1.95932	385.00000

Cronbach Coefficient Alpha

for RAW variables : 0.482047
for STANDARDIZED variables : 0.503115

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.429664	0.269917	0.446862	0.285090	Q3 Effort
VAR2	0.395120	0.300378	0.404525	0.327773	Q7
VAR3	0.286154	0.404859	0.303456	0.424157	Q10
VAR4	0.067246	0.621150	0.066624	0.621512	Q14

Pearson Correlation Coefficients / Prob > IRI under Ho: Rho = 0 / N = 93

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.41269	0.38809	0.05924
Q3 Effort	0.0	0.0001	0.0001	0.5727
VAR2	0.41269	1.00000	0.26044	0.11945
Q7	0.0001	0.0	0.0117	0.2541
VAR3	0.38809	0.26044	1.00000	-0.02791
Q10	0.0001	0.0117	0.0	0.7906
VAR4	0.05924	0.11945	-0.02791	1.00000
Q14	0.5727	0.2541	0.7906	0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	93	4.24731	1.76719	395.00000
VAR2	93	5.13978	1.59204	478.00000
VAR3	93	4.31183	1.82363	401.00000
VAR4	93	4.22581	1.96230	393.00000

Cronbach Coefficient Alpha

for RAW variables : 0.615949
for STANDARDIZED variables : 0.626591

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.476400	0.485023	0.483230	0.499310	Q2 Competence
VAR2	0.464453	0.503092	0.463358	0.514479	Q6
VAR3	0.441512	0.510509	0.450554	0.524141	Q13
VAR4	0.235213	0.672207	0.242289	0.669495	Q16

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 93

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.35847	0.52895	0.13731
Q2 Competence	0.0	0.0004	0.0001	0.1894
VAR2	0.35847	1.00000	0.32177	0.30988
Q6	0.0004	0.0	0.0017	0.0025
VAR3	0.52895	0.32177	1.00000	0.11680
Q13	0.0001	0.0017	0.0	0.2649
VAR4	0.13731	0.30988	0.11680	1.00000
Q16	0.1894	0.0025	0.2649	0.0

Appendix 9 Results of internal consistency in study 2

Appendix Q TWO RESULTS

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	4.00000	7.00000	Interest
VAR2	2.00000	6.00000	Competence
VAR3	3.00000	7.00000	Effort
VAR4	1.00000	5.00000	Tension
VAR5	3.00000	7.00000	Interest
VAR6	1.00000	7.00000	Competence
VAR7	3.00000	7.00000	Effort
VAR8	1.00000	7.00000	Tension
VAR9	4.00000	7.00000	Interest
VAR10	1.00000	7.00000	Competence
VAR11	3.00000	7.00000	Effort
VAR12	4.00000	7.00000	Tension
VAR13	3.00000	7.00000	Interest
VAR14	4.00000	7.00000	Competence
VAR15	1.00000	5.00000	Effort
VAR16	3.00000	7.00000	Tension

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables	:	0.600453
for STANDARDIZED variables	:	0.611532

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.077766	0.603893	0.108308	0.615018	Interest
VAR2	0.429576	0.554847	0.425761	0.564500	Compentent
VAR3	0.405099	0.559052	0.448042	0.560757	Effort
VAR4	-.370550	0.695254	-.444440	0.691289	Tension
VAR5	0.454022	0.545078	0.503848	0.551264	Interest
VAR6	0.713338	0.471352	0.665476	0.522811	Compentent
VAR7	0.623283	0.514257	0.642903	0.526872	Effort
VAR8	0.451359	0.534634	0.445840	0.561128	Tension
VAR9	0.344927	0.568906	0.393697	0.569840	Interest
VAR10	0.153013	0.597381	0.120004	0.613248	Compentent
VAR11	-.343729	0.657850	-.326586	0.676196	Effort
VAR12	0.299946	0.574765	0.303304	0.584603	Tension
VAR13	0.390434	0.561255	0.404187	0.568099	Interest
VAR14	0.136469	0.596673	0.182914	0.603609	Compentent
VAR15	-.356395	0.676044	-.439771	0.690702	Effort
VAR16	0.559606	0.529945	0.611481	0.532477	Tension

Appendix Q TWO RESULTS

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	4.00000	7.00000	Interest
VAR2	2.00000	6.00000	Competence
VAR3	3.00000	7.00000	Effort
VAR4	1.00000	5.00000	Tension
VAR5	3.00000	7.00000	Interest
VAR6	1.00000	7.00000	Competence
VAR7	3.00000	7.00000	Effort
VAR8	1.00000	7.00000	Tension
VAR9	4.00000	7.00000	Interest
VAR10	1.00000	7.00000	Competence
VAR11	3.00000	7.00000	Effort
VAR12	4.00000	7.00000	Tension
VAR13	3.00000	7.00000	Interest
VAR14	4.00000	7.00000	Competence
VAR15	1.00000	5.00000	Effort
VAR16	3.00000	7.00000	Tension

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.600453
for STANDARDIZED variables : 0.611532

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.077766	0.603893	0.108308	0.615018	Interest
VAR2	0.429576	0.554847	0.425761	0.564500	Compentent
VAR3	0.405099	0.559052	0.448042	0.560757	Effort
VAR4	-.370550	0.695254	-.444440	0.691289	Tension
VAR5	0.454022	0.545078	0.503848	0.551264	Interest
VAR6	0.713338	0.471352	0.665476	0.522811	Compentent
VAR7	0.623283	0.514257	0.642903	0.526872	Effort
VAR8	0.451359	0.534634	0.445840	0.561128	Tension
VAR9	0.344927	0.568906	0.393697	0.569840	Interest
VAR10	0.153013	0.597381	0.120004	0.613248	Compentent
VAR11	-.343729	0.657850	-.326586	0.676196	Effort
VAR12	0.299946	0.574765	0.303304	0.584603	Tension
VAR13	0.390434	0.561255	0.404187	0.568099	Interest
VAR14	0.136469	0.596673	0.182914	0.603609	Compentent
VAR15	-.356395	0.676044	-.439771	0.690702	Effort
VAR16	0.559606	0.529945	0.611481	0.532477	Tension

SAS

CORRELATION ANALYSIS

16 'VAR' Variables:	Q1	Q2	Q3	Q4	Q5	Q6
	Q7	Q8	Q9	Q10	Q11	Q12
	Q13	Q14	Q15	Q16		

Simple Statistics

Variable	N	Mean	Std Dev	Sum
VAR1	20	5.45000	0.99868	109.00000
VAR2	20	4.15000	1.13671	83.00000
VAR3	20	5.10000	1.11921	102.00000
VAR4	20	3.15000	1.63111	63.00000
VAR5	20	5.55000	1.31689	111.00000
VAR6	20	3.80000	1.67332	76.00000
VAR7	20	5.15000	1.30888	103.00000
VAR8	20	4.25000	1.74341	85.00000
VAR9	20	6.10000	1.07115	122.00000
VAR10	20	5.40000	1.39170	108.00000
VAR11	20	4.95000	1.09904	99.00000
VAR12	20	5.60000	1.09545	112.00000
VAR13	20	5.25000	1.11803	105.00000
VAR14	20	5.70000	0.97872	114.00000
VAR15	20	2.75000	1.37171	55.00000
VAR16	20	5.40000	1.23117	108.00000

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	20	5.45000	0.99868	109.00000
VAR2	20	5.55000	1.31689	111.00000
VAR3	20	6.10000	1.07115	122.00000
VAR4	20	5.60000	1.09545	112.00000

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	4.00000	7.00000	Q1 Interest
VAR2	3.00000	7.00000	Q5
VAR3	4.00000	7.00000	Q9
VAR4	4.00000	7.00000	Q12

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.677540
for STANDARDIZED variables : 0.675917

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.278756	0.712690	0.272861	0.723933	Q1 Interest
VAR2	0.500056	0.588235	0.500294	0.581276	Q5
VAR3	0.621109	0.506649	0.608634	0.505215	Q9
VAR4	0.466793	0.607027	0.471038	0.600895	Q12

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1 Q1 Interest	1.00000 0.0	0.28213 0.2281	0.20172 0.3937	0.17319 0.4653
VAR2 Q5	0.28213 0.2281	1.00000 0.0	0.51863 0.0191	0.30647 0.1888
VAR3 Q9	0.20172 0.3937	0.51863 0.0191	1.00000 0.0	0.57414 0.0081
VAR4 Q12	0.17319 0.4653	0.30647 0.1883	0.57414 0.0081	1.00000 0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	20	4.15000	1.13671	83.00000
VAR2	20	3.80000	1.67332	76.00000
VAR3	20	5.25000	1.11803	105.00000
VAR4	20	5.40000	1.23117	108.00000

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	2.00000	6.00000	Q3 Effort
VAR2	1.00000	7.00000	Q5
VAR3	3.00000	7.00000	Q9
VAR4	3.00000	7.00000	Q12

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.731764
for STANDARDIZED variables : 0.743367

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.467181	0.702689	0.462918	0.725299	Q2 Competence
VAR2	0.560108	0.669181	0.557740	0.672591	Q6
VAR3	0.589672	0.643259	0.608860	0.642847	Q13
VAR4	0.528655	0.668941	0.519980	0.693959	Q16

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.43166	0.46590	0.21813
Q2 Competence	0.0	0.0574	0.0384	0.3556
VAR2	0.43166	1.00000	0.39386	0.47518
Q6	0.0574	0.0	0.0858	0.0342
VAR3	0.46590	0.39386	1.00000	0.53530
Q13	0.0384	0.0858	0.0	0.0150
VAR4	0.21813	0.47518	0.53530	1.00000
Q16	0.3556	0.0342	0.0150	0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	20	5.10000	1.11921	102.00000
VAR2	20	5.15000	1.30888	103.00000
VAR3	20	5.40000	1.39170	108.00000
VAR4	20	5.70000	0.97872	114.00000

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	3.00000	7.00000	Q2 Ccompetence
VAR2	3.00000	7.00000	Q6
VAR3	1.00000	7.00000	Q13
VAR4	4.00000	7.00000	Q16

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.511081
for STANDARDIZED variables : 0.518042

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.203827	0.518131	0.237524	0.506730	Q3 Effort
VAR2	0.766197	-.114754	0.748576	-.018187	Q7
VAR3	0.092194	0.646048	0.052752	0.650745	Q10
VAR4	0.280891	0.461538	0.302163	0.451033	Q14

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > IRI under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1 Q3 Effort	1.00000 0.0	0.38443 0.0942	-0.19598 0.4076	0.31712 0.1731
VAR2 Q7	0.38443 0.0942	1.00000 0.0	0.45652 0.0430	0.44788 0.0477
VAR3 Q10	-0.19598 0.4076	0.45652 0.0430	1.00000 0.0	-0.13911 0.5586
VAR4 Q14	0.31712 0.1731	0.44788 0.0477	-0.13911 0.5586	1.00000 0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	20	3.15000	1.63111	63.00000
VAR2	20	4.25000	1.74341	85.00000
VAR3	20	4.95000	1.09904	99.00000
VAR4	20	2.75000	0.37171	55.00000

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	1.00000	5.00000	Q4 Tension
VAR2	1.00000	7.00000	Q8
VAR3	3.00000	7.00000	Q11
VAR4	1.00000	5.00000	Q15

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables	:	0.218886
for STANDARDIZED variables	:	0.223354

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.304104	-.164364	0.319810	-.139260	Q4 Tension
VAR2	-.143586	0.539138	-.177456	0.513814	Q8
VAR3	-.132445	0.389360	-.098417	0.430786	Q11
VAR4	0.574460	-.539099	0.591688	-.650112	Q15

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	-0.05090	-0.02496	0.60573
Q4 Tension	0.0	0.8312	0.9168	0.0046
VAR2	-0.05090	1.00000	-0.37769	0.04952
Q8	0.8312	0.0	0.1006	0.8358
VAR3	-0.02496	-0.37769	1.00000	0.20074
Q11	0.9168	0.1006	0.0	0.3961
VAR4	0.60573	0.04952	0.20074	1.00000
Q15	0.0046	0.8358	0.3961	0.0

Appendix 10 Results of internal consistency in study 3

Appendix Q THREE RESULTS

SAS

CORRELATION ANALYSIS

Simple Statistics

Variable	N	Mean	Std Dev
VAR1	20	6 00000	0.79472
VAR2	20	5.05000	1.27680
VAR3	20	5.20000	1.19649
VAR4	20	5.85000	0.87509
VAR5	20	5.05000	1.31689
VAR6	20	5.15000	0.98809
VAR7	20	5.55000	0.94451
VAR8	20	5.25000	0.91047
VAR9	20	5.50000	0.82717
VAR10	20	5.10000	1.25237
VAR11	20	5.40000	0.94032
VAR12	20	5.15000	1.08942

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.853944
for STANDARDIZED variables : 0.856055

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.550893	0.842643	0.569702	0.842195	interest
VAR2	0.789187	0.820814	0.761747	0.828515	competence
VAR3	0.044830	0.878755	0.059100	0.875398	effort
VAR4	0.511377	0.844748	0.543869	0.843984	interest
VAR5	0.749259	0.823988	0.712077	0.832119	competence
VAR6	0.575755	0.839509	0.601801	0.839956	effort
VAR7	0.548696	0.841508	0.568640	0.842269	interest
VAR8	0.722502	0.826714	0.690226	0.833689	effort
VAR9	0.515362	0.843733	0.519805	0.845640	interest
VAR10	0.467453	0.845215	0.505215	0.846639	competence
VAR11	0.523266	0.842943	0.478477	0.848459	effort
VAR12	0.387990	0.851411	0.391110	0.854320	competence

SAS

CORRELATION ANALYSIS

Simple Statistics

Variable	N	Mean	Std Dev	Sum
VAR1	20	5.05000	1.27630	101.00000
VAR2	20	5.05000	1.31689	101.00000
VAR3	20	5.10000	1.25237	102.00000
VAR4	20	5.15000	1.08942	103.00000

Simple Statistics

Variable	Minimum	Maximum	Label
VAR1	2.00000	7.00000	Q2
VAR2	2.00000	7.00000	Q5
VAR3	2.00000	7.00000	Q10
VAR4	3.00000	7.00000	Q12

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.934414
for STANDARDIZED variables : 0.935236

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.739616	0.948966	0.730949	0.951797	Q2 competence
VAR2	0.956668	0.875874	0.955295	0.879478	Q5
VAR3	0.891708	0.898957	0.896841	0.899087	Q10
VAR4	0.812276	0.926794	0.812623	0.926382	Q12

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1 Q1 Interest	1.00000 0.0	0.84392 0.0001	0.68819 0.0008	0.56211 0.0099
VAR2 Q3	0.84392 0.0001	1.00000 0.0	0.89037 0.0001	0.83827 0.0001
VAR3 Q6	0.68819 0.0008	0.89037 0.0001	1.00000 0.0	0.87568 0.0001
VAR4 Q8	0.56211 0.0099	0.83827 0.0001	0.87568 0.0001	1.00000 0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Variable	N	Mean	Std Dev	Sum
VAR1	20	6.00000	0.79472	120.00000
VAR2	20	5.85000	0.87509	117.00000
VAR3	20	5.55000	0.94451	111.00000
VAR4	20	5.50000	0.82717	110.00000

Simple Statistics

Variable	Minimum	Maximum	Label
VAR2	4.00000	8.00000	Q4
VAR3	4.00000	7.00000	Q7
VAR4	4.00000	8.00000	Q10

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.837066
for STANDARDIZED variables : 0.834507

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.444857	0.880798	0.444649	0.882763	Q1 interest
VAR2	0.860064	0.702977	0.858310	0.699523	Q4
VAR3	0.699082	0.781345	0.694244	0.777334	Q7
VAR4	0.698549	0.781388	0.689790	0.779350	Q9

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.52976	0.35059	0.32026
Q1 Interest	0.0	0.0163	0.1296	0.1686
VAR2	0.52976	1.00000	0.74184	0.76346
Q3	0.0163	0.0	0.0002	0.0001
VAR3	0.35059	0.74184	1.00000	0.63998
Q6	0.1296	0.0002	0.0	0.0024
VAR4	0.32026	0.76346	0.63998	1.00000
Q8	0.1686	0.0001	0.0024	0.0

SAS

CORRELATION ANALYSIS

Simple Statistics

Variable	N	Mean	Std Dev	Sum
VAR1	20	5.20000	1.19649	104.00000
VAR2	20	5.15000	0.98809	103.00000
VAR3	20	5.25000	0.91047	105.00000
VAR4	20	5.40000	0.94032	108.00000

Simple Statistics

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.704418
for STANDARDIZED variables : 0.743133

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.080970	0.906764	0.080064	0.907519	Q3
VAR2	0.694170	0.510215	0.730715	0.567548	Q6
VAR3	0.669007	0.540153	0.706039	0.583152	Q8
VAR4	0.714201	0.505927	0.755294	0.551368	Q11

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 20

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.10685	0.04831	0.06549
Q1 Interest	0.0	0.6539	0.8397	0.7838
VAR2	0.10685	1.00000	0.71668	0.78172
Q3	0.6539	0.0	0.0004	0.0001
VAR3	0.04831	0.71668	1.00000	0.79919
Q6	0.8397	0.0004	0.0	0.0001
VAR4	0.06549	0.78172	0.79919	1.00000
Q8	0.7838	0.0001	0.0001	0.0

Appendix 11 Results of internal consistency in study 4

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	80	5.06250	1.01062	405.00000
VAR2	80	4.65000	1.18107	372.00000
VAR3	80	4.88750	1.14730	391.00000
VAR4	80	4.87500	1.14045	390.00000

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.811490
for STANDARDIZED variables : 0.810030

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.516266	0.812388	0.517079	0.812536	Q1 interest
VAR2	0.630258	0.763705	0.623891	0.763247	Q3
VAR3	0.725486	0.715415	0.729208	0.711559	Q6
VAR4	0.653232	0.751839	0.645774	0.752763	Q8

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > IRI under Ho: Rho = 0 / N = 80

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.35791	0.58475	0.38027
Q1 Interest	0.0	0.0011	0.0001	0.0005
VAR2	0.35791	1.00000	0.56843	0.61554
Q3	0.0011	0.0	0.0001	0.0001
VAR3	0.58475	0.56843	1.00000	0.58892
Q6	0.0001	0.0001	0.0	0.0001
VAR4	0.38027	0.61554	0.58892	1.00000
Q8	0.0005	0.0001	0.0001	0.0

Appendix Q FOUR RESULTS

SAS

CORRELATION ANALYSIS

11 'VAR' Variables:	Q1	Q2	Q3	Q4	Q5	Q6
	Q7	Q8	Q9	Q10	Q11	

Simple Statistics

Variable	N	Mean	Std Dev	Sum
VAR1	80	5.06250	1.01062	405.00000
VAR2	80	4.63750	1.22468	371.00000
VAR3	80	4.88750	1.14730	391.00000
VAR4	80	4.92500	1.19889	394.00000
VAR5	80	5.00000	0.90007	400.00000
VAR6	80	4.65000	1.18107	372.00000
VAR7	80	5.12500	0.91920	410.00000
VAR8	80	4.87500	1.14045	390.00000
VAR9	80	4.88750	1.19061	391.00000
VAR10	80	5.40000	0.85091	432.00000
VAR11	80	5.03750	1.01188	403.00000

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.909080
for STANDARDIZED variables : 0.901438

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.578857	0.904718	0.570519	0.896326	interest
VAR2	0.867693	0.888099	0.865256	0.979410	competence
VAR3	0.791097	0.893154	0.776333	0.884643	interest
VAR4	0.869404	0.888143	0.852187	0.880187	competence
VAR5	0.465401	0.909645	0.479144	0.907326	effort
VAR6	0.745616	0.895752	0.740223	0.886736	interest
VAR7	0.396308	0.912682	0.408644	0.905106	effort
VAR8	0.702382	0.898281	0.686574	0.889811	interest
VAR9	0.825820	0.890884	0.814879	0.882389	competence
VAR10	0.281540	0.916775	0.294906	0.911064	effort
VAR11	0.586216	0.904360	0.563171	0.896733	competence

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	80	5.06250	1.01062	405.00000
VAR2	80	4.65000	1.18107	372.00000
VAR3	80	4.88750	1.14730	391.00000
VAR4	80	4.87500	1.14045	390.00000

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.811490
for STANDARDIZED variables : 0.810030

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.516266	0.812388	0.517079	0.812536	Q1 interest
VAR2	0.630258	0.763705	0.623891	0.763247	Q3
VAR3	0.725486	0.715415	0.729208	0.711559	Q6
VAR4	0.653232	0.751839	0.645774	0.752763	Q8

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > IRI under Ho: Rho = 0 / N = 80

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.35791	0.58475	0.38027
Q1 Interest	0.0	0.0011	0.0001	0.0005
VAR2	0.35791	1.00000	0.56843	0.61554
Q3	0.0011	0.0	0.0001	0.0001
VAR3	0.58475	0.56843	1.00000	0.58892
Q6	0.0001	0.0001	0.0	0.0001
VAR4	0.38027	0.61554	0.58892	1.00000
Q8	0.0005	0.0001	0.0001	0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	80	4.63750	1.22468	371.00000
VAR2	80	4.88750	1.19061	391.00000
VAR3	80	4.92500	1.19889	394.00000
VAR4	80	5.03750	1.01188	403.00000

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.895501
for STANDARDIZED variables : 0.894328

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.765847	0.867065	0.756833	0.867265	Q2 competence
VAR2	0.810718	0.849158	0.809037	0.847706	Q4
VAR3	0.871983	0.824776	0.868156	0.824914	Q9
VAR4	0.638127	0.909433	0.638969	0.909514	Q11

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 80

	VAR1	VAR2	VAR3	VAR4
VAR1	1.00000	0.71826	0.80889	0.49120
Q2 competence	0.0	0.0001	0.0001	0.0001
VAR2	0.71826	1.00000	0.78326	0.62345
Q4	0.0001	0.0	0.0001	0.0001
VAR3	0.80889	0.78326	1.00000	0.64928
Q9	0.0001	0.0001	0.0	0.0001
VAR4	0.49120	0.62345	0.64928	1.00000
Q11	0.0001	0.0001	0.0001	0.0

SAS

CORRELATION ANALYSIS

4 'VAR' Variables: VAR1 VAR2 VAR3 VAR4

Simple Statistics

Vaiable	N	Mean	Std Dev	Sum
VAR1	80	5.00000	0.90007	400.00000
VAR2	80	5.40000	0.85091	432.00000
VAR3	80	5.12500	0.91920	410.00000

CORRELATION ANALYSIS

Cronbach Coefficient Alpha

for RAW variables : 0.737938
for STANDARDIZED variables : 0.739550

	Raw Variables		Std. Variables		
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha	Label
VAR1	0.587049	0.622395	0.589890	0.623672	Q5 effort
VAR2	0.596692	0.614570	0.597378	0.614664	Q7
VAR3	0.507211	0.718816	0.507417	0.719542	Q10

CORRELATION ANALYSIS

Pearson Correlation Coefficients / Prob > lRl under Ho: Rho = 0 / N = 80

	VAR1	VAR2	VAR3
VAR1	1.00000	0.56194	0.44369
Q5 effort	0.0	0.0001	0.0001
VAR2	0.56194	1.00000	0.45314
Q7	0.0001	0.0	0.0001
VAR3	0.44369	0.45314	1.00000
Q10	0.0001	0.0001	0.0

Appendix 12 Raw data for test-retest reliability

SUBJ	Y7M1	Y7M2	Y7F1	Y7F2	Y10M1	Y10M2	Y10F1	Y10F2	OCC1	OCC2
1001	57	58	44	41	66	65	43	44	57	58
1002	56	56	43	45	44	43	40	41	56	56
1003	49	49	45	46	57	58	48	47	49	49
1004	50	51	33	34	74	75	44	46	50	51
1005	59	63	30	37	37	38	52	54	59	63
1006	57	56	42	43	40	41	41	42	57	56
1007	57	58	41	42	72	73	53	53	57	58
1008	54	54	40	40	57	59	54	51	54	54
1009	57	58	37	39	48	49	34	36	57	58
1010	52	51	36	50	62	64	38	39	52	51
1011	45	44	30	49	59	62	32	34	45	44
1012	33	35	42	44	52	50	40	41	33	35
1013	45	47	43	45	64	66	52	53	45	47
1014	37	39	37	38	39	38	48	49	37	39
1015	51	54	38	41	64	66	32	36	51	54
1016	53	55	42	46	60	62	43	42	53	55
1017	48	51	47	60	53	55	66	63	48	51
1018	27	28	29	31	58	59	45	44	27	28
1019	23	27	47	42	47	45	46	42	23	27
1020	58	58	41	45	54	55	41	43	58	58
1021	65	62	50	53	65	66	35	37	65	62
1022	64	66	60	62	46	45	35	32	64	66
1023	54	57	44	45	41	43	46	44	54	57
1024	45	49	44	44	47	49	44	42	45	49
1025	36	38	49	39	49	48	44	45	36	38
1026	65	67	44	43	40	42	48	47	65	67
1027	49	52	47	45	35	36	48	49	49	52
1028	45	46	50	52	62	64	43	44	45	46
1029	45	44	70	72	71	72	42	43	45	44
1030	69	72	33	35	65	66	45	47	69	72
1031									44	41
1032									43	45
1033									45	46
1034									33	34
1035									30	37
1036									42	43
1037									41	42
1038									40	40
1039									37	39
1040									36	50
1041									30	49
1042									42	44
1043									43	45
1044									37	38
1045									38	41
1046									42	46
1047									47	60
1048									29	31
1049									47	42
1050									41	45
1051									50	53
1052									60	62
1053									44	45
1054									44	44
1055									49	39
1056									44	43

Appendix 13 Result of test-retest reliability for IMI

```
-> GET FILE
-> "c:\winword\statcons\trtest.sav"
-> .
-> EXECUTE
-> .
-> CORRELATIONS
->   /VARIABLES=y10f1 y10f2 y10m1 y10m2 y7f1 y7f2 y7m1 y7m2
->   /PRINT=TWOTAIL SIG
->   /MISSING=PAIRWISE .
```

- - Correlation Coefficients - -

	Y10F1	Y10F2	Y10M1	Y10M2	Y7F1	Y7F2
Y10F1	1.0000	.9656	-.1103	-.0949	-.0108	-.0653
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .	P= .000	P= .562	P= .618	P= .955	P= .732
Y10F2	.9656	1.0000	-.0446	-.0268	-.1006	-.1318
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .000	P= .	P= .815	P= .888	P= .597	P= .488
Y10M1	-.1103	-.0446	1.0000	.9936	.0292	.1359
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .562	P= .815	P= .	P= .000	P= .878	P= .474
Y10M2	-.0949	-.0268	.9936	1.0000	.0020	.1440
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .618	P= .888	P= .000	P= .	P= .992	P= .448
Y7F1	-.0108	-.1006	.0292	.0020	1.0000	.7988
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .955	P= .597	P= .878	P= .992	P= .	P= .000
Y7F2	-.0653	-.1318	.1359	.1440	.7988	1.0000
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .732	P= .488	P= .474	P= .448	P= .000	P= .
Y7M1	-.1093	-.0540	.0455	.0809	.0192	.1224
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .565	P= .777	P= .811	P= .671	P= .920	P= .519
Y7M2	-.0491	.0000	-.0171	.0185	-.0004	.0768
	(30)	(30)	(30)	(30)	(30)	(30)
	P= .796	P=1.000	P= .928	P= .923	P= .998	P= .687

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

- - Correlation Coefficients - -

	Y7M1	Y7M2
Y10F1	-.1093	-.0491
	(30)	(30)
	P= .565	P= .796
Y10F2	-.0540	.0000
	(30)	(30)
	P= .777	P=1.000
Y10M1	.0455	-.0171
	(30)	(30)
	P= .811	P= .928
Y10M2	.0809	.0185
	(30)	(30)
	P= .671	P= .923
Y7F1	.0192	-.0004

```
          (    30)     (    30)
          P= .920      P= .998

?7F2          .1224        .0768
          (    30)     (    30)
          P= .519      P= .687

?7M1         1.0000        .9875
          (    30)     (    30)
          P= .         P= .000

?7M2          .9875       1.0000
          (    30)     (    30)
          P= .000      P= .

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed



-> CORRELATIONS
->   /VARIABLES=occ1 occ2
->   /PRINT=TWOTAIL SIG
->   /MISSING=PAIRWISE .


                  - -  Correlation Coefficients  - -

             OCC1         OCC2

OCC1         1.0000        .9560
          (   120)     (   120)
          P= .         P= .000

OCC2          .9560       1.0000
          (   120)     (   120)
          P= .000      P= .

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed
```

Appendix 14 Raw data for experiment 1

SUBJ	AGE	TRT	SEX	P1	IM1	PC1	IM2	P2	PC2	IM3	PC3	IM4	P3	PC4	IM5
1001	7	1	1	56	45	4	58	51	4	70	7	71	53	7	69
1002	7	1	1	46	44	5	52	47	6	63	5	62	48	5	64
1003	7	1	1	57	47	4	63	52	5	70	4	71	53	4	70
1004	7	1	1	54	48	3	57	52	5	61	7	64	54	6	66
1005	7	1	1	48	43	3	57	50	5	64	5	60	51	6	62
1006	7	1	1	62	46	3	40	53	4	52	4	54	50	5	56
1007	7	1	1	59	44	3	41	46	5	48	4	60	52	4	61
1008	7	1	1	52	47	4	57	53	6	62	5	63	54	4	60
1009	7	1	1	64	45	5	55	51	6	60	6	60	52	6	43
1010	7	1	1	60	46	4	60	45	5	62	7	64	46	7	65
1011	7	1	1	58	45	7	61	50	7	69	4	70	49	5	70
1012	7	1	1	47	45	5	36	47	6	48	2	44	48	3	50
1013	7	1	1	65	44	4	53	46	7	54	6	51	47	7	57
1014	7	1	1	46	44	4	57	52	5	59	4	57	53	6	60
1015	7	1	1	49	47	3	42	52	4	53	5	56	53	4	62
1016	7	1	1	46	48	3	46	52	3	56	6	57	51	6	60
1017	7	2	1	57	44	4	50	45	4	51	4	51	46	4	54
1018	7	2	1	56	48	5	58	46	5	54	5	52	48	5	51
1019	7	2	1	49	48	4	50	50	4	52	4	61	49	4	56
1020	7	2	1	50	50	5	46	50	3	43	3	45	52	4	49
1021	7	2	1	59	42	5	57	47	6	59	6	57	48	6	62
1022	7	2	1	57	40	4	59	48	4	64	4	70	47	4	68
1023	7	2	1	57	46	4	46	44	3	47	3	49	45	4	53
1024	7	2	1	57	46	4	49	48	4	49	4	51	49	5	54
1025	7	2	1	52	52	3	57	50	3	56	6	51	50	4	52
1026	7	2	1	45	46	3	52	48	3	56	4	57	49	7	62
1027	7	2	1	45	48	3	46	46	4	50	3	53	47	6	53
1028	7	2	1	51	43	4	54	47	4	56	4	58	47	4	60
1029	7	2	1	48	45	5	52	46	4	43	5	42	45	5	47
1030	7	2	1	58	52	5	54	53	5	55	4	50	52	4	54
1031	7	2	1	65	55	6	67	49	6	68	5	59	52	4	58
1032	7	2	1	64	48	7	66	50	7	60	6	63	51	5	65
1033	7	2	1	54	46	4	60	47	4	62	7	64	53	7	70
1034	7	2	1	45	45	5	49	47	5	51	4	51	48	4	56
1035	7	2	1	65	44	5	68	44	5	65	4	67	45	4	66
1036	7	2	1	45	42	5	52	47	6	52	6	54	48	6	58
1037	7	2	1	49	42	5	72	50	6	70	6	68	51	6	69
1038	7	1	2	46	44	4	44	48	5	49	5	47	49	5	48
1039	7	1	2	40	42	4	42	47	4	48	4	46	45	5	46
1040	7	1	2	60	44	7	58	48	7	61	7	65	49	7	62
1041	7	1	2	45	40	5	49	47	6	53	5	54	49	5	53
1042	7	1	2	45	43	4	46	46	5	50	6	53	45	6	52
1043	7	1	2	49	40	4	52	45	5	54	4	51	45	5	60
1044	7	1	2	50	45	4	50	49	4	53	7	52	48	7	54
1045	7	1	2	48	38	3	48	51	7	52	5	51	53	6	51
1046	7	1	2	46	31	3	52	41	4	56	5	50	46	5	46
1047	7	1	2	70	44	4	74	49	5	70	5	65	47	6	63
1048	7	1	2	48	40	5	49	49	5	54	6	53	51	5	60
1049	7	1	2	44	45	3	48	44	5	56	5	56	45	4	60
1050	7	1	2	51	40	4	54	46	4	58	6	61	47	3	63
1051	7	1	2	57	46	4	54	51	6	62	6	60	53	6	58
1052	7	1	2	67	48	4	64	52	5	66	5	62	51	6	63
1053	7	2	2	45	39	4	46	43	4	46	4	49	44	4	50
1054	7	2	2	44	40	3	57	42	3	60	3	62	45	3	63
1055	7	2	2	54	48	4	48	46	4	50	5	48	45	5	49
1056	7	2	2	50	45	4	54	44	4	52	4	56	46	4	54
1057	7	2	2	41	40	5	43	42	5	53	5	54	45	4	56
1058	7	2	2	51	48	4	54	45	4	57	4	57	47	4	58
1059	7	2	2	49	43	5	42	43	5	49	5	49	44	5	51
1060	7	2	2	46	39	3	49	36	2	53	2	54	40	3	53
1061	7	2	2	49	38	4	58	38	3	60	5	62	45	5	61
1062	7	2	2	46	40	5	46	44	5	52	7	57	42	7	58
1063	7	2	2	48	34	4	46	36	6	46	4	48	38	5	50
1064	7	2	2	53	41	4	43	40	4	51	4	49	42	4	51
1065	7	2	2	44	40	3	43	43	4	42	3	41	46	3	43
1066	7	2	2	48	42	3	50	46	4	51	5	52	48	4	53
1067	7	2	2	48	32	6	48	45	7	49	4	48	50	4	49

SUBJ	AGE	TRT	SEX	P1	IM1	PC1	IM2	P2	PC2	IM3	PC3	IM4	P3	PC4	IM5
1068	7	2	2	45	34	7	43	43	5	46	3	57	44	5	58
1069	7	2	2	46	39	4	42	39	4	48	4	46	40	4	48
1070	10	1	2	51	43	3	53	49	4	55	4	56	48	4	56
1071	10	1	2	51	46	3	49	52	5	60	5	64	53	5	64
1072	10	1	2	46	48	2	46	53	5	59	4	60	49	5	61
1073	10	1	2	58	45	5	61	52	4	67	4	65	54	4	62
1074	10	1	2	47	44	4	48	50	4	64	6	67	49	5	67
1075	10	1	2	47	40	3	50	40	4	60	4	62	48	4	64
1076	10	1	2	45	44	3	44	45	4	62	3	58	50	3	52
1077	10	1	2	52	44	3	51	51	4	63	4	69	49	4	67
1078	10	1	2	60	47	6	54	49	5	64	5	60	54	5	66
1079	10	1	2	54	47	4	56	49	4	60	4	63	52	4	63
1080	10	1	2	47	44	3	49	42	4	58	5	62	47	3	58
1081	10	1	2	44	46	4	47	50	5	59	5	64	46	5	66
1082	10	1	2	47	46	4	49	48	4	60	3	60	48	4	64
1083	10	1	2	48	45	2	49	52	3	50	3	48	51	4	45
1084	10	1	2	44	47	1	46	50	3	63	3	65	48	4	64
1085	10	1	2	47	45	3	45	48	2	58	2	60	48	3	62
1086	10	1	2	52	40	4	55	48	4	62	4	59	49	4	54
1087	10	1	2	46	44	2	47	49	5	43	5	60	50	5	56
1088	10	1	2	49	45	2	52	49	4	62	4	61	50	4	62
1089	10	1	2	60	47	3	64	51	5	70	5	70	52	5	71
1090	10	2	2	51	43	4	46	43	4	46	4	47	44	4	47
1091	10	2	2	53	45	4	51	42	3	53	3	52	46	3	51
1092	10	2	2	51	46	4	52	46	4	57	4	56	46	4	61
1093	10	2	2	51	45	3	54	48	4	56	5	60	47	6	54
1094	10	2	2	60	45	5	64	46	6	62	7	61	47	7	63
1095	10	2	2	55	48	3	57	44	4	60	4	64	46	5	64
1096	10	2	2	48	50	3	46	46	2	50	2	53	43	2	51
1097	10	2	2	48	48	4	49	50	1	48	3	43	48	4	60
1098	10	2	2	56	45	4	57	45	3	60	3	42	47	3	43
1099	10	2	2	55	46	4	60	47	4	64	4	60	45	4	62
1100	10	2	2	47	43	3	43	44	4	47	4	49	45	4	51
1101	10	2	2	48	45	3	40	46	3	45	4	46	46	5	42
1102	10	2	2	49	46	3	47	43	2	50	2	52	45	3	53
1103	10	2	2	59	42	6	54	41	4	60	3	62	43	4	61
1104	10	2	2	45	46	7	50	49	3	54	4	56	52	4	52
1105	10	2	2	57	45	3	54	44	4	58	4	60	48	4	61
1106	10	2	2	54	43	3	55	45	4	57	5	60	46	5	62
1107	10	2	2	44	40	4	48	44	5	46	4	62	47	4	63
1108	10	2	2	50	40	4	42	39	4	49	4	39	42	5	41
1109	10	2	2	44	40	3	39	46	4	50	5	46	45	2	45
1110	10	2	2	45	46	4	46	45	2	49	3	51	46	4	53
1111	10	2	2	45	48	3	42	44	5	48	4	52	47	3	51
1112	10	1	1	47	48	4	48	49	5	53	5	52	47	5	53
1113	10	1	1	57	46	5	56	48	5	64	5	63	49	5	64
1114	10	1	1	58	48	4	60	45	5	69	6	67	47	6	52
1115	10	1	1	67	52	5	67	52	4	72	5	70	49	5	60
1116	10	1	1	50	45	4	49	54	5	64	4	64	54	4	66
1117	10	1	1	56	51	6	60	50	6	72	5	74	54	5	72
1118	10	1	1	47	55	4	49	52	6	60	5	62	56	6	65
1119	10	1	1	51	47	4	54	50	5	69	6	65	57	7	64
1120	10	1	1	49	56	4	46	50	5	46	4	45	52	4	51
1121	10	1	1	69	50	7	70	54	6	72	5	71	56	3	69
1122	10	1	1	54	49	4	55	53	4	60	6	61	55	6	62
1123	10	1	1	49	52	3	47	51	4	64	7	62	54	5	60
1124	10	1	1	51	52	3	54	54	4	62	5	63	58	4	62
1125	10	1	1	55	48	3	56	54	4	58	4	56	56	5	60
1126	10	1	1	47	46	4	49	49	5	53	4	54	50	5	57
1127	10	1	1	66	47	2	60	49	3	65	3	64	49	4	66
1128	10	1	1	60	42	3	54	48	4	63	2	62	50	5	63
1129	10	1	1	53	52	2	57	49	4	65	1	64	51	2	62
1130	10	2	1	46	48	4	48	50	4	50	4	50	47	4	52
1131	10	2	1	63	51	5	62	50	4	64	4	64	51	4	66
1132	10	2	1	59	54	4	63	52	5	67	4	63	53	4	64
1133	10	2	1	51	56	3	57	46	3	60	3	60	48	3	59
1134	10	2	1	52	54	4	49	52	4	45	4	44	52	4	60

SUBJ	AGE	TRT	SEX	P1	IM1	PC1	IM2	P2	PC2	IM3	PC3	IM4	P3	PC4	IM5
1135	10	2	1	46	53	3	40	48	2	42	2	48	50	5	47
1136	10	2	1	44	49	3	41	48	4	42	4	46	50	6	48
1137	10	2	1	55	48	4	57	47	4	60	3	54	50	2	56
1138	10	2	1	52	45	4	54	56	4	51	4	54	53	5	52
1139	10	2	1	52	49	5	55	53	4	58	4	56	53	6	53
1140	10	2	1	67	47	4	63	49	4	62	3	64	50	4	63
1141	10	2	1	45	46	5	46	44	4	48	4	51	46	3	49
1142	10	2	1	58	50	5	60	45	5	61	5	62	47	7	63
1143	10	2	1	51	54	4	53	53	4	58	4	60	52	6	61
1144	10	2	1	49	46	4	57	49	4	54	3	53	50	2	54
1145	10	2	1	44	50	3	43	52	5	49	4	51	54	5	52
1146	10	2	1	46	52	3	42	54	4	40	4	54	56	5	59
1147	10	2	1	48	52	3	46	54	3	39	2	40	52	6	46

Appendix 15 Results of MANOVA for main study 1

>Error # 12003 in column 80. Text: (End of Command)
>A parenthesized value range is required for every factor in the factor
>list. The lowest and highest values of the factor must be specified. Any
>cases outside of this range will be rejected.
>This command not executed.

\- -

The default error term in MANOVA has been changed from WITHIN CELLS to WITHIN+RESIDUAL. Note that these are the same for all full factorial designs.

>Warning # 12190
>There are one or more completely empty categories for one or more factors
>specified on the MANOVA command. To run the analysis in this release,
>please recode the values of affected factors to sequential integer values
>and rerun.

MISSING CATEGORIES

VARIABLE	VALUE
C1	8
C1	9

>Error # 4617 in column 2. Text: MANOVA
>Something other than the keyword 'INTO' was found on a RECODE command after
>the parenthesized value specifications.
>This command not executed.

\- -

The default error term in MANOVA has been changed from WITHIN CELLS to WITHIN+RESIDUAL. Note that these are the same for all full factorial designs.

* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

147 cases accepted.
0 cases rejected because of out-of-range factor values.
0 cases rejected because of missing data.
8 non-empty cells.

1 design will be processed.

\- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY C3
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.11269	1.35468	12.00	128.00	.196
Hotellings	.12700	1.35468	12.00	128.00	.196
Wilks	.88731	1.35468	12.00	128.00	.196
Roys	.11269				

Note.. F statistics are exact.

\- -

EFFECT .. C1 BY C2 BY C3 (Cont.)
Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	115.67762	5314.97012	115.67762	38.23720	3.02526	.084
C5	5.72314	1502.68628	5.72314	10.81069	.52940	.468
C6	2.71456	155.22520	2.71456	1.11673	2.43081	.121
C7	220.16886	6845.53969	220.16886	49.24849	4.47057	.036
	.12497	1139.09419	.12497	8.19492	.01525	.902
	.34162	141.00097	.34162	1.01440	.33677	.563
	44.51003	6377.53994	44.51003	45.88158	.97011	.326
	5.00846	177.07360	5.00846	1.27391	3.93156	.049

C12	8.13475	6249.63468	8.13475	44.96140	.18093	.671
C13	.22240	1003.54736	.22240	7.21977	.03080	.861
C14	1.35399	172.90400	1.35399	1.24391	1.08849	.299
C15	5.59538	5755.22850	5.59538	41.40452	.13514	.714

- -

****** A n a l y s i s   o f   V a r i a n c e -- design 1 ******

EFFECT .. C2 BY C3
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.14217	1.76785	12.00	128.00	.060
Hotellings	.16574	1.76785	12.00	128.00	.060
Wilks	.85783	1.76785	12.00	128.00	.060
Roys	.14217				

Note.. F statistics are exact.

- -

EFFECT .. C2 BY C3 (Cont.)
Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	3.02311	5314.97012	3.02311	38.23720	.07906	.779
C5	31.72403	1502.68628	31.72403	10.81069	2.93451	.089
C6	.14349	155.22520	.14349	1.11673	.12849	.721
C7	71.41173	6845.53969	71.41173	49.24849	1.45003	.231
C8	102.66537	1139.09419	102.66537	8.19492	12.52793	.001
C9	.00320	141.00097	.00320	1.01440	.00315	.955
C10	9.48087	6377.53994	9.48087	45.88158	.20664	.650
C11	.01172	177.07360	.01172	1.27391	.00920	.924
C12	4.08539	6249.63468	4.08539	44.96140	.09086	.764
C13	35.17841	1003.54736	35.17841	7.21977	4.87251	.029
C14	.62880	172.90400	.62880	1.24391	.50550	.478
C15	2.25603	5755.22850	2.25603	41.40452	.05449	.816

- -

****** A n a l y s i s   o f   V a r i a n c e -- design 1 ******

EFFECT .. C1 BY C3
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.08040	.93252	12.00	128.00	.517
Hotellings	.08742	.93252	12.00	128.00	.517
Wilks	.91960	.93252	12.00	128.00	.517
Roys	.08040				

Note.. F statistics are exact.

- -

EFFECT .. C1 BY C3 (Cont.)
Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	29.11485	5314.97012	29.11485	38.23720	.76143	.384
C5	.05339	1502.68628	.05339	10.81069	.00494	.944
C6	.98504	155.22520	.98504	1.11673	.88208	.349
C7	2.72318	6845.53969	2.72318	49.24849	.05529	.814
C8	2.49831	1139.09419	2.49831	8.19492	.30486	.582
C9	.91578	141.00097	.91578	1.01440	.90278	.344
C10	63.00104	6377.53994	63.00104	45.88158	1.37312	.243
C11	.02170	177.07360	.02170	1.27391	.01703	.896
C12	125.07593	6249.63468	125.07593	44.96140	2.78185	.098
C13	.28098	1003.54736	.28098	7.21977	.03892	.844
C14	.70113	172.90400	.70113	1.24391	.56365	.454
C15	134.93430	5755.22850	134.93430	41.40452	3.25893	.073

- -

****** A n a l y s i s   o f   V a r i a n c e -- design 1 ******

EFFECT .. C1 BY C2
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.09050	1.06139	12.00	128.00	.398
Hotellings	.09950	1.06139	12.00	128.00	.398
Wilks	.90950	1.06139	12.00	128.00	.398
Roys	.09050				

Note.. F statistics are exact.

- -

EFFECT .. C1 BY C2 (Cont.)
Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	8.19764	5314.97012	8.19764	38.23720	.21439	.644
C5	9.22223	1502.68628	9.22223	10.81069	.85307	.357
C6	.00902	155.22520	.00902	1.11673	.00807	.929
C7	16.81171	6845.53969	16.81171	49.24849	.34137	.560
C8	23.32298	1139.09419	23.32298	8.19492	2.84603	.094
C9	.16682	141.00097	.16682	1.01440	.16445	.686
C10	129.31254	6377.53994	129.31254	45.88158	2.81840	.095
C11	.53455	177.07360	.53455	1.27391	.41961	.518
C12	192.33269	6249.63468	192.33269	44.96140	4.27773	.040
C13	1.33997	1003.54736	1.33997	7.21977	.18560	.667
C14	2.88223	172.90400	2.88223	1.24391	2.31707	.130
C15	115.88317	5755.22850	115.88317	41.40452	2.79880	.097

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C3
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.49288	10.36724	12.00	128.00	.000
Hotellings	.97193	10.36724	12.00	128.00	.000
Wilks	.50712	10.36724	12.00	128.00	.000
Roys	.49288				

Note.. F statistics are exact.

- -

EFFECT .. C3 (Cont.)
Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	535.72533	5314.97012	535.72533	38.23720	14.01058	.000
C5	859.05305	1502.68628	859.05305	10.81069	79.46328	.000
C6	2.12935	155.22520	2.12935	1.11673	1.90678	.170
C7	447.83914	6845.53969	447.83914	49.24849	9.09346	.003
C8	513.48707	1139.09419	513.48707	8.19492	62.65918	.000
C9	3.27871	141.00097	3.27871	1.01440	3.23218	.074
C10	241.21120	6377.53994	241.21120	45.88158	5.25726	.023
C11	.21469	177.07360	.21469	1.27391	.16853	.682
C12	228.69281	6249.63468	228.69281	44.96140	5.08643	.026
C13	487.55991	1003.54736	487.55991	7.21977	67.53127	.000
C14	5.14187	172.90400	5.14187	1.24391	4.13362	.044
C15	310.54851	5755.22850	310.54851	41.40452	7.50035	.007

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.57379	14.36032	12.00	128.00	.000
Hotellings	1.34628	14.36032	12.00	128.00	.000
Wilks	.42621	14.36032	12.00	128.00	.000
Roys	.57379				

Note.. F statistics are exact.

- -

EFFECT .. C2 (Cont.)

Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	95.10104	5314.97012	95.10104	38.23720	2.48713	.117
C5	.06840	1502.68628	.06840	10.81069	.00633	.937
C6	3.19395	155.22520	3.19395	1.11673	2.86010	.093
C7	62.29269	6845.53969	62.29269	49.24849	1.26487	.263
C8	335.73139	1139.09419	335.73139	8.19492	40.96822	.000
C9	16.90724	141.00097	16.90724	1.01440	16.66730	.000
C10	1549.65980	6377.53994	1549.65980	45.88158	33.77520	.000
C11	18.34095	177.07360	18.34095	1.27391	14.39736	.000
C12	1254.55660	6249.63468	1254.55660	44.96140	27.90297	.000
C13	309.26509	1003.54736	309.26509	7.21977	42.83589	.000
C14	8.98806	172.90400	8.98806	1.24391	7.22563	.008
C15	776.07251	5755.22850	776.07251	41.40452	18.74367	.000

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1
Multivariate Tests of Significance (S = 1, M = 5 , N = 63)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.41597	7.59714	12.00	128.00	.000
Hotellings	.71223	7.59714	12.00	128.00	.000
Wilks	.58403	7.59714	12.00	128.00	.000
Roys	.41597				

Note.. F statistics are exact.

- -

EFFECT .. C1 (Cont.)
Univariate F-tests with (1,139) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	.09147	5314.97012	.09147	38.23720	.00239	.961
C5	520.02306	1502.68628	520.02306	10.81069	48.10266	.000
C6	9.42017	155.22520	9.42017	1.11673	8.43551	.004
C7	.00127	6845.53969	.00127	49.24849	.00003	.996
C8	116.97556	1139.09419	116.97556	8.19492	14.27415	.000
C9	18.19890	141.00097	18.19890	1.01440	17.94063	.000
C10	106.53111	6377.53994	106.53111	45.88158	2.32187	.130
C11	22.12383	177.07360	22.12383	1.27391	17.36686	.000
C12	136.81869	6249.63468	136.81869	44.96140	3.04303	.083
C13	111.08930	1003.54736	111.08930	7.21977	15.38683	.000
C14	12.38893	172.90400	12.38893	1.24391	9.95964	.002
C15	48.08744	5755.22850	48.08744	41.40452	1.16141	.283

- -

```
Data list file='c:\choi\ibp.dat' free records=1/
c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12 c13 c14 c15.
recode c1 (7=9).
manova c4 c5 c6 c7 c8 c9 c10 c11 c12 c13 c14 c15 by
c1 (9,10) c2 (1,2) c3 (1,2).
```

Appendix 16 Results of ANOVA for main study 1

```
> data list file='c:\winword\statcons\choi\ibp.dat' free records=1/
> c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12 c13 c14 c15.
> EXECUTE.
> RECODE
>   c1  (7=1)  (10=2)  .
> EXECUTE .
> MANOVA
>   c4  c7  c10  c12  c15  BY c1(1 2) c2(1 2) c3(1 2)
>   /WSFACTORS time(5)
>   /METHOD UNIQUE
>   /ERROR WITHIN+RESIDUAL
>   /PRINT
>     SIGNIF( MULT AVERF )
>   /NOPRINT PARAM(ESTIM) .
```

- -

```
* * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

     147 cases accepted.
       0 cases rejected because of out-of-range factor values.
       0 cases rejected because of missing data.
       8 non-empty cells.

       1 design will be processed.
```

- -

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests of Between-Subjects Effects.

 Tests of Significance for T1 using UNIQUE sums of squares
 Source of Variation          SS      DF        MS         F  Sig of F

 WITHIN+RESIDUAL          22031.49     139    158.50
 C1                         170.76       1    170.76      1.08      .301
 C2                        2893.84       1   2893.84     18.26      .000
 C3                        1714.36       1   1714.36     10.82      .001
 C1 BY C2                   277.39       1    277.39      1.75      .188
 C1 BY C3                   285.51       1    285.51      1.80      .182
 C2 BY C3                     1.94       1      1.94       .01      .912
 C1 BY C2 BY C3             146.31       1    146.31       .92      .338

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.


 Mauchly sphericity test, W =       .36967
 Chi-square approx. =           136.75088 with 9 D. F.
 Significance =                      .000

 Greenhouse-Geisser Epsilon =       .66949
 Huynh-Feldt Epsilon =              .71826
 Lower-bound Epsilon =              .25000

AVERAGED Tests of Significance that follow multivariate tests are equivalent to
univariate or split-plot or mixed-model approach to repeated measures.
Epsilons may be used to adjust d.f. for the AVERAGED results.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. C1 BY C2 BY C3 BY TIME
 Multivariate Tests of Significance (S = 1, M = 1 , N = 67 )

 Test Name          Value    Exact F Hypoth. DF   Error DF  Sig. of F

 Pillais           .07445    2.73503       4.00     136.00       .031
 Hotellings        .08044    2.73503       4.00     136.00       .031
 Wilks             .92555    2.73503       4.00     136.00       .031
 Roys              .07445
 Note.. F statistics are exact.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. C2 BY C3 BY TIME
 Multivariate Tests of Significance (S = 1, M = 1 , N = 67 )

 Test Name          Value    Exact F Hypoth. DF   Error DF  Sig. of F

 Pillais           .07816    2.88281       4.00     136.00       .025
 Hotellings        .08479    2.88281       4.00     136.00       .025
 Wilks             .92184    2.88281       4.00     136.00       .025
 Roys              .07816
 Note.. F statistics are exact.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. C1 BY C3 BY TIME
```

Multivariate Tests of Significance (S = 1, M = 1 , N = 67)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02680	.93616	4.00	136.00	.445
Hotellings	.02753	.93616	4.00	136.00	.445
Wilks	.97320	.93616	4.00	136.00	.445
Roys	.02680				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 1 , N = 67)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.04946	1.76907	4.00	136.00	.139
Hotellings	.05203	1.76907	4.00	136.00	.139
Wilks	.95054	1.76907	4.00	136.00	.139
Roys	.04946				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 1 , N = 67)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01940	.67272	4.00	136.00	.612
Hotellings	.01979	.67272	4.00	136.00	.612
Wilks	.98060	.67272	4.00	136.00	.612
Roys	.01940				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 1 , N = 67)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.32730	16.54273	4.00	136.00	.000
Hotellings	.48655	16.54273	4.00	136.00	.000
Wilks	.67270	16.54273	4.00	136.00	.000
Roys	.32730				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY TIME
Multivariate Tests of Significance (S = 1, M = 1 , N = 67)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.05764	2.07966	4.00	136.00	.087
Hotellings	.06117	2.07966	4.00	136.00	.087
Wilks	.94236	2.07966	4.00	136.00	.087
Roys	.05764				

Note.. F statistics are exact.

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. TIME
Multivariate Tests of Significance (S = 1, M = 1 , N = 67)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.61428	54.14641	4.00	136.00	.000
Hotellings	1.59254	54.14641	4.00	136.00	.000
Wilks	.38572	54.14641	4.00	136.00	.000
Roys	.61428				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

AVERAGED Tests of Significance for C using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	8511.43	556	15.31		
TIME	4690.52	4	1172.63	76.60	.000
C1 BY TIME	120.77	4	30.19	1.97	.097
C2 BY TIME	843.84	4	210.96	13.78	.000
C3 BY TIME	49.66	4	12.42	.81	.518
C1 BY C2 BY TIME	185.15	4	46.29	3.02	.017
C1 BY C3 BY TIME	69.34	4	17.33	1.13	.340
C2 BY C3 BY TIME	88.32	4	22.08	1.44	.219
C1 BY C2 BY C3 BY TIME	247.77	4	61.94	4.05	.003

- -

```
-> MANOVA
->   c6  c9  c11  c14  BY c1(1 2) c2(1 2) c3(1 2)
->   /WSFACTORS time(4)
->   /METHOD UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /PRINT
->     SIGNIF( MULT AVERF )
->   /NOPRINT PARAM(ESTIM) .
```

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

147 cases accepted.
0 cases rejected because of out-of-range factor values.
0 cases rejected because of missing data.
8 non-empty cells.

1 design will be processed.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

Tests of Between-Subjects Effects.

Tests of Significance for T1 using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	328.89	139	2.37		
C1	60.52	1	60.52	25.58	.000
C2	23.07	1	23.07	9.75	.002

C3	9.00	1	9.00	3.80	.053
C1 BY C2	1.88	1	1.88	.79	.374
C1 BY C3	2.15	1	2.15	.91	.342
C2 BY C3	.05	1	.05	.02	.880
C1 BY C2 BY C3	7.93	1	7.93	3.35	.069

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

Mauchly sphericity test, W = .72958
Chi-square approx. = 43.42126 with 5 D. F.
Significance = .000

Greenhouse-Geisser Epsilon = .81160
Huynh-Feldt Epsilon = .86873
Lower-bound Epsilon = .33333

AVERAGED Tests of Significance that follow multivariate tests are equivalent to univariate or split-plot or mixed-model approach to repeated measures.
Epsilons may be used to adjust d.f. for the AVERAGED results.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02107	.98278	3.00	137.00	.403
Hotellings	.02152	.98278	3.00	137.00	.403
Wilks	.97893	.98278	3.00	137.00	.403
Roys	.02107				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00551	.25295	3.00	137.00	.859
Hotellings	.00554	.25295	3.00	137.00	.859
Wilks	.99449	.25295	3.00	137.00	.859
Roys	.00551				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00531	.24366	3.00	137.00	.866
Hotellings	.00534	.24366	3.00	137.00	.866
Wilks	.99469	.24366	3.00	137.00	.866
Roys	.00531				

Note.. F statistics are exact.

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01219	.56350	3.00	137.00	.640
Hotellings	.01234	.56350	3.00	137.00	.640
Wilks	.98781	.56350	3.00	137.00	.640
Roys	.01219				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02505	1.17335	3.00	137.00	.322
Hotellings	.02569	1.17335	3.00	137.00	.322
Wilks	.97495	1.17335	3.00	137.00	.322
Roys	.02505				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.20554	11.81471	3.00	137.00	.000
Hotellings	.25872	11.81471	3.00	137.00	.000
Wilks	.79446	11.81471	3.00	137.00	.000
Roys	.20554				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01962	.91403	3.00	137.00	.436
Hotellings	.02002	.91403	3.00	137.00	.436
Wilks	.98038	.91403	3.00	137.00	.436
Roys	.01962				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. TIME
Multivariate Tests of Significance (S = 1, M = 1/2, N = 67 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F

```
Hotellings        .31638   14.44780      3.00     137.00       .000
Wilks             .75966   14.44780      3.00     137.00       .000
Roys              .24034
Note.. F statistics are exact.
```

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

```
 AVERAGED Tests of Significance for C using UNIQUE sums of squares
 Source of Variation          SS      DF        MS        F  Sig of F

 WITHIN+RESIDUAL          317.31     417       .76
 TIME                      37.64       3     12.55    16.49      .000
 C1 BY TIME                 1.61       3       .54      .71      .548
 C2 BY TIME                24.36       3      8.12    10.67      .000
 C3 BY TIME                 1.76       3       .59      .77      .510
 C1 BY C2 BY TIME           1.71       3       .57      .75      .523
 C1 BY C3 BY TIME            .47       3       .16      .21      .892
 C2 BY C3 BY TIME            .73       3       .24      .32      .810
 C1 BY C2 BY C3 BY TI       1.48       3       .49      .65      .583
 ME
```

- -

```
-> MANOVA
->   c5  c8  c13  BY c1(1 2) c2(1 2) c3(1 2)
->   /WSFACTORS time(3)
->   /METHOD UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /PRINT
->     SIGNIF( MULT AVERF )
->   /NOPRINT PARAM(ESTIM) .
```

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

```
      147 cases accepted.
        0 cases rejected because of out-of-range factor values.
        0 cases rejected because of missing data.
        8 non-empty cells.

        1 design will be processed.
```

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests of Between-Subjects Effects.

```
 Tests of Significance for T1 using UNIQUE sums of squares
 Source of Variation          SS      DF        MS        F  Sig of F

 WITHIN+RESIDUAL         2302.86     139     16.57
 C1                       650.02       1    650.02    39.23      .000
 C2                       436.10       1    436.10    26.32      .000
 C3                      1827.83       1   1827.83   110.33      .000
 C1 BY C2                  27.14       1     27.14     1.64      .203
 C1 BY C3                    .22       1       .22      .01      .908
 C2 BY C3                 156.90       1    156.90     9.47      .003
 C1 BY C2 BY C3              .82       1       .82      .05      .824
```

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

Mauchly sphericity test, W = .71060
Chi-square approx. = 47.14750 with 2 D. F.
Significance = .000

Greenhouse-Geisser Epsilon = .77555
Huynh-Feldt Epsilon = .82217
Lower-bound Epsilon = .50000

AVERAGED Tests of Significance that follow multivariate tests are equivalent to univariate or split-plot or mixed-model approach to repeated measures.
Epsilons may be used to adjust d.f. for the AVERAGED results.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00508	.35245	2.00	138.00	.704
Hotellings	.00511	.35245	2.00	138.00	.704
Wilks	.99492	.35245	2.00	138.00	.704
Roys	.00508				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.03302	2.35649	2.00	138.00	.099
Hotellings	.03415	2.35649	2.00	138.00	.099
Wilks	.96698	2.35649	2.00	138.00	.099
Roys	.03302				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00779	.54168	2.00	138.00	.583
Hotellings	.00785	.54168	2.00	138.00	.583
Wilks	.99221	.54168	2.00	138.00	.583
Roys	.00779				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02115	1.49122	2.00	138.00	.229

Hotellings	.02161	1.49122	2.00	138.00	.229
Wilks	.97885	1.49122	2.00	138.00	.229
Roys	.02115				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.03031	2.15699	2.00	138.00	.120
Hotellings	.03126	2.15699	2.00	138.00	.120
Wilks	.96969	2.15699	2.00	138.00	.120
Roys	.03031				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.17257	14.39034	2.00	138.00	.000
Hotellings	.20856	14.39034	2.00	138.00	.000
Wilks	.82743	14.39034	2.00	138.00	.000
Roys	.17257				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.08739	6.60722	2.00	138.00	.002
Hotellings	.09576	6.60722	2.00	138.00	.002
Wilks	.91261	6.60722	2.00	138.00	.002
Roys	.08739				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 68)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.50262	69.72624	2.00	138.00	.000
Hotellings	1.01053	69.72624	2.00	138.00	.000
Wilks	.49738	69.72624	2.00	138.00	.000
Roys	.50262				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

AVERAGED Tests of Significance for C using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	1342.47	278	4.83		
TIME	912.92	2	456.46	94.52	.000
C1 BY TIME	98.07	2	49.03	10.15	.000
C2 BY TIME	208.96	2	104.48	21.64	.000
C3 BY TIME	32.27	2	16.13	3.34	.037
C1 BY C2 BY TIME	6.74	2	3.37	.70	.498
C1 BY C3 BY TIME	2.61	2	1.30	.27	.763
C2 BY C3 BY TIME	12.66	2	6.33	1.31	.271
C1 BY C2 BY C3 BY TI ME	5.25	2	2.63	.54	.581

- -

Appendix 17 Results of path analysis for main study 1

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc5
->   /METHOD=ENTER zc1 zc3  .


          * * * *   M U L T I P L E   R E G R E S S I O N   * * * *


Listwise Deletion of Missing Data

Equation Number 1    Dependent Variable..   ZC5    Zscore(C5)

Block Number  1.  Method:  Enter       ZC1       ZC3


Variable(s) Entered on Step Number
   1..    ZC3         Zscore(C3)
   2..    ZC1         Zscore(C1)


Multiple R           .67829
R Square             .46007
Adjusted R Square    .45257
Standard Error       .73988

Analysis of Variance
                    DF      Sum of Squares      Mean Square
Regression           2            67.17072         33.58536
Residual           144            78.82928           .54743

F =      61.35147        Signif F =  .0000

----------------- Variables in the Equation ------------------

Variable              B        SE B       Beta          T  Sig T

ZC1             .428942     .061404    .428942      6.986  .0000
ZC3            -.558387     .061404   -.558387     -9.094  .0000
(Constant)  3.43067E-16     .061024                  .000 1.0000


End Block Number   1   All requested variables entered.

-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc4
->   /METHOD=ENTER zc5 zc1 zc3  .


          * * * *   M U L T I P L E   R E G R E S S I O N   * * * *


Listwise Deletion of Missing Data

Equation Number 1    Dependent Variable..   ZC4    Zscore(C4)

Block Number  1.  Method:  Enter       ZC5       ZC1       ZC3


Variable(s) Entered on Step Number
   1..    ZC3         Zscore(C3)
   2..    ZC1         Zscore(C1)
   3..    ZC5         Zscore(C5)


Multiple R           .32636
R Square             .10651
```

```
Adjust[illegible]
Standard Error          .95511

Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           3              15.55067            5.18356
Residual           143             130.44933             .91223

F =        5.68227        Signif F =   .0011

------------------ Variables in the Equation ------------------

Variable                B            SE B         Beta           T   Sig T

ZC5              .187691         .107574      .187691       1.745   .0832
ZC1             -.069995         .091719     -.069995       -.763   .4466
ZC3             -.191583         .099455     -.191583      -1.926   .0560
(Constant)   1.50267E-15         .078776                     .000  1.0000

End Block Number   1   All requested variables entered.


-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc6
->   /METHOD=ENTER zc5 zc1 zc3  .


        * * * *   M U L T I P L E   R E G R E S S I O N   * * * *


Listwise Deletion of Missing Data

Equation Number 1    Dependent Variable..   ZC6   Zscore(C6)

Block Number  1.  Method:  Enter      ZC5      ZC1      ZC3


Variable(s) Entered on Step Number
  1..     ZC3          Zscore(C3)
  2..     ZC1          Zscore(C1)
  3..     ZC5          Zscore(C5)


Multiple R              .28085
R Square                .07888
Adjusted R Square       .05955
Standard Error          .96977

Analysis of Variance
                    DF        Sum of Squares        Mean Square
Regression           3              11.51599            3.83866
Residual           143             134.48401             .94045

F =        4.08174        Signif F =   .0081

------------------ Variables in the Equation ------------------

Variable                B            SE B         Beta           T   Sig T

ZC5             -.083906         .109225     -.083906       -.768   .4436
ZC1             -.202181         .093126     -.202181      -2.171   .0316
ZC3             -.165715         .100981     -.165715      -1.641   .1030
(Constant)  -4.58202E-16         .079985                     .000  1.0000

End Block Number   1   All requested variables entered.


-> REGRESSION
->   /MISSING LISTWISE
```

```
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc7
->   /METHOD=ENTER zc4 zc6 zc1 zc3  .
```

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Listwise Deletion of Missing Data

Equation Number 1   Dependent Variable..   ZC7   Zscore(C7)

Block Number 1. Method: Enter   ZC4   ZC6   ZC1   ZC3

Variable(s) Entered on Step Number
1.. ZC3 Zscore(C3)
2.. ZC1 Zscore(C1)
3.. ZC6 Zscore(C6)
4.. ZC4 Zscore(C4)

Multiple R	.72062
R Square	.51929
Adjusted R Square	.50575
Standard Error	.70303

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	75.81682	18.95421
Residual	142	70.18318	.49425

F =   38.34961   Signif F = .0000

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC4	.664845	.063542	.664845	10.463	.0000
ZC6	.112935	.063114	.112935	1.789	.0757
ZC1	.015965	.060302	.015965	.265	.7916
ZC3	-.043852	.061112	-.043852	-.718	.4742
(Constant)	-9.60929E-17	.057985		.000	1.0000

End Block Number 1 All requested variables entered.

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc8
->   /METHOD=ENTER zc5 zc7 zc6 zc2 zc1 zc3  .
```

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Listwise Deletion of Missing Data

Equation Number 1   Dependent Variable..   ZC8   Zscore(C8)

Block Number 1. Method: Enter
ZC5   ZC7   ZC6   ZC2   ZC1   ZC3

Variable(s) Entered on Step Number
1.. ZC3 Zscore(C3)
2.. ZC2 Zscore(C2)
3.. ZC1 Zscore(C1)

```
         Zscore(C7)
   5..     ZC6       Zscore(C6)
   6..     ZC5       Zscore(C5)


Multiple R           .73233
R Square             .53630
Adjusted R Square    .51643
Standard Error       .69539

Analysis of Variance
                    DF      Sum of Squares      Mean Square
Regression           6            78.30034         13.05006
Residual           140            67.69966           .48357

F =      26.98696       Signif F =  .0000

------------------ Variables in the Equation ------------------

Variable              B          SE B         Beta          T  Sig T

ZC5            .426068       .079026      .426068      5.391  .0000
ZC7            .059490       .063392      .059490       .938  .3496
ZC6            .029216       .064097      .029216       .456  .6492
ZC2           -.385471       .058801     -.385471     -6.556  .0000
ZC1            .055264       .067872      .055264       .814  .4169
ZC3           -.235432       .073599     -.235432     -3.199  .0017
(Constant)  2.33990E-15      .057355                    .000 1.0000

End Block Number   1   All requested variables entered.


-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc10
->   /METHOD=ENTER zc7 zc8 zc9 zc2 zc1 zc3 .



          * * * *   M U L T I P L E   R E G R E S S I O N   * * * *


Listwise Deletion of Missing Data

Equation Number 1    Dependent Variable..   ZC10   Zscore(C10)

Block Number  1.  Method:  Enter
   ZC7      ZC8      ZC9      ZC2      ZC1      ZC3


Variable(s) Entered on Step Number
   1..     ZC3       Zscore(C3)
   2..     ZC2       Zscore(C2)
   3..     ZC1       Zscore(C1)
   4..     ZC7       Zscore(C7)
   5..     ZC9       Zscore(C9)
   6..     ZC8       Zscore(C8)


Multiple R           .87233
R Square             .76096
Adjusted R Square    .75072
Standard Error       .49928

Analysis of Variance
                    DF      Sum of Squares      Mean Square
Regression           6           111.10042         18.51674
Residual           140            34.89958           .24928

F =      74.28007       Signif F =  .0000
```

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC7	.767913	.044289	.767913	17.339	.0000
ZC8	-.087060	.055225	-.087060	-1.576	.1172
ZC9	-.006144	.047741	-.006144	-.129	.8978
ZC2	-.401631	.048340	-.401631	-8.308	.0000
ZC1	.128687	.046007	.128687	2.797	.0059
ZC3	-.016461	.050157	-.016461	-.328	.7433
(Constant)	8.56007E-16	.041180		.000	1.0000

End Block Number 1 All requested variables entered.

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc9
->   /METHOD=ENTER zc6 zc8 zc2 zc1 zc3 .
```

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Listwise Deletion of Missing Data

Equation Number 1   Dependent Variable..   ZC9   Zscore(C9)

Block Number 1. Method: Enter
ZC6   ZC8   ZC2   ZC1   ZC3

Variable(s) Entered on Step Number
1.. ZC3 Zscore(C3)
2.. ZC2 Zscore(C2)
3.. ZC1 Zscore(C1)
4.. ZC6 Zscore(C6)
5.. ZC8 Zscore(C8)

Multiple R	.64362
R Square	.41425
Adjusted R Square	.39348
Standard Error	.77879

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	60.48094	12.09619
Residual	141	85.51906	.60652

F = 19.94365   Signif F = .0000

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC6	.471474	.067801	.471474	6.954	.0000
ZC8	.031426	.085505	.031426	.368	.7138
ZC2	-.359545	.073229	-.359545	-4.910	.0000
ZC1	-.214729	.069593	-.214729	-3.085	.0024
ZC3	-.069231	.077384	-.069231	-.895	.3725
(Constant)	-2.07107E-17	.064234		.000	1.0000

End Block Number 1 All requested variables entered.

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
```

```
->   /[illegible]
->   /NOORIGIN
->   /DEPENDENT zc11
->   /METHOD=ENTER zc8 zc9 zc2 zc1 zc3  .
```

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Listwise Deletion of Missing Data

Equation Number 1   Dependent Variable..   ZC11   Zscore(C11)

Block Number 1. Method: Enter
ZC8   ZC9   ZC2   ZC1   ZC3

Variable(s) Entered on Step Number

1..	ZC3	Zscore(C3)
2..	ZC2	Zscore(C2)
3..	ZC1	Zscore(C1)
4..	ZC9	Zscore(C9)
5..	ZC8	Zscore(C8)

Multiple R	.56333
R Square	.31734
Adjusted R Square	.29313
Standard Error	.84076

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	46.33140	9.26628
Residual	141	99.66860	.70687

F =   13.10890   Signif F = .0000

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC8	.149348	.092343	.149348	1.617	.1080
ZC9	.404136	.078453	.404136	5.151	.0000
ZC2	-.095362	.081325	-.095362	-1.173	.2429
ZC1	-.222371	.077432	-.222371	-2.872	.0047
ZC3	.094157	.083725	.094157	1.125	.2627
(Constant)	-2.22122E-15	.069344		.000	1.0000

End Block Number 1 All requested variables entered.

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc12
->   /METHOD=ENTER zc10 zc11 zc2 zc1 zc3  .
```

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Listwise Deletion of Missing Data

Equation Number 1   Dependent Variable..   ZC12   Zscore(C12)

Block Number 1. Method: Enter
ZC10   ZC11   ZC2   ZC1   ZC3

Variable(s) Entered on Step Number

```
  1..
  2..     ZC2         Zscore(C2)
  3..     ZC1         Zscore(C1)
  4..     ZC11        Zscore(C11)
  5..     ZC10        Zscore(C10)


Multiple R              .85456
R Square                .73027
Adjusted R Square       .72071
Standard Error          .52848

Analysis of Variance
                     DF      Sum of Squares      Mean Square
Regression            5           106.61971         21.32394
Residual            141            39.38029           .27929

F =      76.34977       Signif F =  .0000


------------------ Variables in the Equation ------------------

Variable                 B          SE B        Beta           T  Sig T

ZC10              .805168       .051339     .805168      15.683  .0000
ZC11              .064500       .049745     .064500       1.297  .1969
ZC2              -.038143       .049332    -.038143       -.773  .4407
ZC1               .056216       .047396     .056216       1.186  .2376
ZC3              -.024719       .044650    -.024719       -.554  .5807
(Constant)  1.94232E-15       .043588                      .000 1.0000


End Block Number   1   All requested variables entered.


-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc13
->   /METHOD=ENTER zc12 zc8 zc11 zc2 zc1 zc3  .



           * * * *   M U L T I P L E   R E G R E S S I O N   * * * *


Listwise Deletion of Missing Data

Equation Number 1    Dependent Variable..   ZC13   Zscore(C13)

Block Number  1.  Method:  Enter
   ZC12      ZC8       ZC11      ZC2       ZC1       ZC3


Variable(s) Entered on Step Number
   1..     ZC3         Zscore(C3)
   2..     ZC2         Zscore(C2)
   3..     ZC1         Zscore(C1)
   4..     ZC11        Zscore(C11)
   5..     ZC12        Zscore(C12)
   6..     ZC8         Zscore(C8)


Multiple R              .86436
R Square                .74711
Adjusted R Square       .73627
Standard Error          .51354

Analysis of Variance
                     DF      Sum of Squares      Mean Square
Regression            6           109.07841         18.17973
Residual            140            36.92159           .26373

F =      68.93426       Signif F =  .0000
```

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC12	.065696	.049400	.065696	1.330	.1857
ZC8	.679713	.056922	.679713	11.941	.0000
ZC11	.058578	.048955	.058578	1.197	.2335
ZC2	-.096757	.051355	-.096757	-1.884	.0616
ZC1	.091581	.048669	.091581	1.882	.0620
ZC3	-.164671	.051418	-.164671	-3.203	.0017
(Constant)	-1.89436E-15	.042356		.000	1.0000

End Block Number 1 All requested variables entered.

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
->   /CRITERIA=PIN(.05) POUT(.10)
->   /NOORIGIN
->   /DEPENDENT zc14
->   /METHOD=ENTER zc11 zc13 zc2 zc1 zc3  .
```

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. ZC14 Zscore(C14)

Block Number 1. Method: Enter
ZC11 ZC13 ZC2 ZC1 ZC3

Variable(s) Entered on Step Number
1.. ZC3 Zscore(C3)
2.. ZC2 Zscore(C2)
3.. ZC1 Zscore(C1)
4.. ZC11 Zscore(C11)
5.. ZC13 Zscore(C13)

Multiple R	.65738
R Square	.43215
Adjusted R Square	.41202
Standard Error	.76680

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	63.09416	12.61883
Residual	141	82.90584	.58798

F = 21.46116 Signif F = .0000

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC11	.606240	.071102	.606240	8.526	.0000
ZC13	.001180	.088505	.001180	.013	.9894
ZC2	-.031610	.073559	-.031610	-.430	.6681
ZC1	-.050734	.072021	-.050734	-.704	.4823
ZC3	-.143522	.077870	-.143522	-1.843	.0674
(Constant)	2.03024E-15	.063245		.000	1.0000

End Block Number 1 All requested variables entered.

```
-> REGRESSION
->   /MISSING LISTWISE
->   /STATISTICS COEFF OUTS R ANOVA
```

```
->          [illegible]
->   /NOORIGIN
->   /DEPENDENT zc15
->   /METHOD=ENTER zc12 zc13 zc14 zc2 zc1 zc3  .
```

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Listwise Deletion of Missing Data

Equation Number 1   Dependent Variable..   ZC15   Zscore(C15)

Block Number 1. Method: Enter
ZC12   ZC13   ZC14   ZC2   ZC1   ZC3

Variable(s) Entered on Step Number
1.. ZC3 Zscore(C3)
2.. ZC2 Zscore(C2)
3.. ZC1 Zscore(C1)
4.. ZC14 Zscore(C14)
5.. ZC12 Zscore(C12)
6.. ZC13 Zscore(C13)

Multiple R	.86276
R Square	.74435
Adjusted R Square	.73339
Standard Error	.51634

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	6	108.67466	18.11244
Residual	140	37.32534	.26661

F =   67.93620   Signif F = .0000

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ZC12	.840980	.048491	.840980	17.343	.0000
ZC13	.086727	.059295	.086727	1.463	.1458
ZC14	.016110	.046293	.016110	.348	.7284
ZC2	.037857	.051642	.037857	.733	.4647
ZC1	-.044436	.047148	-.044436	-.942	.3476
ZC3	-.021502	.052549	-.021502	-.409	.6830
(Constant)	-5.95548E-15	.042587		.000	1.0000

End Block Number   1   All requested variables entered.

Appendix 18 Results of LISREL for main study 1

```
-> prelis
-> /varibales c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12 c13 c14 c15 (co)
-> /type=corr
-> /matrix=out ('path matrix').
```

P R E L I S 1.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING PRELIS CONTROL LINES HAVE BEEN READ :

```
SPSS for MS WINDOWS Release 6.0;
DA NI=15 NO=0 MI= -0.989898D+37 MC=1 TR=LI
LA
  C1          C2          C3          C4          C5          C6          C7          C8          C9
RA FI=c:\windows\temp\spssb6.tmp
CO C1
CO C2
CO C3
CO C4
CO C5
CO C6
CO C7
CO C8
CO C9
CO C10
CO C11
CO C12
CO C13
CO C14
CO C15
OU MA=KM SM=c:\windows\temp\spssb7.tmp
```

TOTAL SAMPLE SIZE = 147

UNIVARIATE SUMMARY STATISTICS FOR CONTINUOUS VARIABLES

VARIABLE	MEAN	ST. DEV.	SKEWNESS	KURTOSIS	MINIMUM	FREQ.	MAXIMUM	FREQ.
C1	8.592	1.502	-.124	-1.971	7.000	69	10.000	78
C2	1.531	.501	-.124	-1.971	1.000	69	2.000	78
C3	1.503	.502	-.014	-1.986	1.000	73	2.000	74
C4	51.660	6.458	.821	.005	40.000	1	70.000	1
C5	45.469	4.428	-.250	.949	31.000	1	56.000	2
C6	3.959	1.097	.681	1.012	1.000	1	7.000	6
C7	51.925	7.263	.481	.063	36.000	1	74.000	1
C8	47.660	3.900	-.490	.140	36.000	2	56.000	1
C9	4.381	1.112	.078	.535	1.000	1	7.000	6
C10	56.259	7.644	.004	-.686	39.000	1	72.000	3
C11	4.381	1.229	.133	.062	1.000	1	7.000	9
C12	56.810	7.510	-.149	-.583	39.000	1	74.000	1
C13	48.803	3.652	-.017	-.044	38.000	1	58.000	1
C14	4.633	1.183	.144	-.217	2.000	5	7.000	11
C15	57.571	7.006	-.241	-.683	41.000	1	72.000	1

ESTIMATED CORRELATION MATRIX

	C1	C2	C3	C4	C5	C6
C1	1.000					
C2	-.038	1.000				
C3	.075	-.007	1.000			
C4	-.012	-.109	-.296	1.000		
C5	.387	-.011	-.526	.261	1.000	
C6	-.247	.152	-.137	.300	-.075	1.000
C7	-.023	-.079	-.255	.711	.196	.314
C8	.209	-.391	-.472	.227	.585	-.024
C9	-.316	-.292	-.162	.248	-.138	.479
C10	.109	-.432	-.157	.565	.172	.164
C11	-.308	-.264	-.058	.177	-.059	.255
C12	.124	-.405	-.151	.449	.142	.110
C13	.215	-.407	-.491	.230	.531	.015
C14	-.247	-.189	-.183	.149	.004	.152
C15	.071	-.339	-.197	.385	.183	.115

ESTIMATED CORRELATION MATRIX

	C7	C8	C9	C10	C11	C12
C7	1.000					
C8	.241	1.000				
C9	.257	.148	1.000			
C10	.778	.289	.257	1.000		
C11	.275	.156	.509	.296	1.000	
C12	.650	.290	.257	.851	.297	1.000
C13	.274	.843	.213	.355	.191	.355
C14	.176	.222	.378	.135	.639	.170
C15	.580	.323	.232	.731	.260	.857

ESTIMATED CORRELATION MATRIX

	C13	C14	C15
C13	1.000		
C14	.189	1.000	
C15	.374	.183	1.000

THE PROBLEM USED 51928 BYTES (= 10.1% OF AVAILABLE WORKSPACE)

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=15 no=147
->  /se / 9 10  1 2 3/
->  /mo ny=2 nx=3 be=sd ps=di
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=15 NO=147 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb9.tmp FO
```

```
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12       C13       C14       C15
SE
 9 10  1 2 3/
MO NY=2 NX=3 BE=SD PS=DI
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 15

NUMBER OF Y - VARIABLES 2

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 2

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 147

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C9	C10	C1	C2	C3
C9	1.000				
C10	.257	1.000			
C1	-.316	.109	1.000		
C2	-.292	-.432	-.038	1.000	
C3	-.162	-.157	.075	-.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C9	C10
C9	0	0
C10	1	0

GAMMA

	C1	C2	C3
C9	2	3	4
C10	5	6	7

PSI

C9	C10
8	9

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C9	C10
C9	.000	.000
C10	.176	.000

	C1	C2	C3
C9	-.317	-.305	-.140
C10	.161	-.375	-.144

COVARIANCE MATRIX OF Y AND X

	C9	C10	C1	C2	C3
C9	1.000				
C10	.257	1.000			
C1	-.316	.109	1.000		
C2	-.292	-.432	-.038	1.000	
C3	-.162	-.157	.075	-.007	1.000

PSI

C9	C10
.788	.753

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C9	C10
.212	.247

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .365

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C9	C10
C9	.000	.000
C10	.176	.000

GAMMA

	C1	C2	C3
C9	-.317	-.305	-.140
C10	.161	-.375	-.144

COVARIANCE MATRIX OF Y AND X

	C9	C10	C1	C2	C3
C9	1.000				
C10	.257	1.000			
C1	-.316	.109	1.000		
C2	-.292	-.432	-.038	1.000	
C3	-.162	-.157	.075	-.007	1.000

PSI

C9	C10
.788	.753

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C9	C10
.212	.247

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .365

CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

~~GOODNESS~~ OF FIT INDEX =1.000

ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS

SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS

SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C9	C10
C9	.000	.000
C10	.082	.000

GAMMA

	C1	C2	C3
C9	.074	.074	.074
C10	.077	.077	.074

PSI

C9	C10
.093	.089

UNSPECIFIED TITLE

T-VALUES

BETA

	C9	C10
C9	.000	.000
C10	2.148	.000

GAMMA

	C1	C2	C3
C9	-4.258	-4.100	-1.886
C10	2.081	-4.889	-1.951

PSI

C9	C10
8.456	8.456

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

```
 TOTAL EFFECTS OF X ON Y

              C1          C2          C3
          --------    --------    --------
 C9         -.317       -.305       -.140
 C10         .105       -.429       -.168

 STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

              C1          C2          C3
          --------    --------    --------
 C9          .074        .074        .074
 C10         .074        .074        .074

 INDIRECT EFFECTS OF X ON Y

              C1          C2          C3
          --------    --------    --------
 C9          .000        .000        .000
 C10        -.056       -.053       -.025

 STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

              C1          C2          C3
          --------    --------    --------
 C9          .000        .000        .000
 C10         .029        .028        .017

 TOTAL EFFECTS OF Y ON Y

              C9         C10
          --------    --------
 C9          .000        .000
 C10         .176        .000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS    .031

 STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

              C9         C10
          --------    --------
 C9          .000        .000
 C10         .082        .000

 INDIRECT EFFECTS OF Y ON Y

              C9         C10
          --------    --------
 C9          .000        .000



 C10         .000        .000

 STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

              C9         C10
          --------    --------
 C9          .000        .000
 C10         .000        .000

     THE PROBLEM USED     4080 BYTES (=   .8% OF AVAILABLE WORKSPACE)

                       TIME USED :     2.2 SECONDS


-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=15 no=147
->  /se /8 9 10  1 2 3/
->  /mo ny=3 nx=3 be=sd ps=di
->  /ou se tv ef.
```

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=15 NO=147 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb12.tmp FO
(5E14.6)
LA
 C1       C2       C3       C4       C5       C6       C7       C8
 C9       C10      C11      C12      C13      C14      C15
SE
8 9 10  1 2 3/
MO NY=3 NX=3 BE=SD PS=DI
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 15

NUMBER OF Y - VARIABLES 3

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 3

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 147

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C8	C9	C10	C1	C2	C3
C8	1.000					
C9	.148	1.000				
C10	.289	.257	1.000			
C1	.209	-.316	.109	1.000		
C2	-.391	-.292	-.432	-.038	1.000	
C3	-.472	-.162	-.157	.075	-.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C8	C9	C10
C8	0	0	0
C9	1	0	0
C10	2	3	0

GAMMA

~~C1~~ ~~C2~~ C3

C8	4	5	6
C9	7	8	9
C10	10	11	12

PSI

C8	C9	C10
13	14	15

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C8	C9	C10
C8	.000	.000	.000
C9	.052	.000	.000
C10	.026	.175	.000

GAMMA

	C1	C2	C3
C8	.231	-.386	-.492
C9	-.329	-.285	-.115
C10	.155	-.366	-.131

COVARIANCE MATRIX OF Y AND X

	C8	C9	C10	C1	C2	C3
C8	1.000					
C9	.148	1.000				
C10	.289	.257	1.000			
C1	.209	-.316	.109	1.000		
C2	-.391	-.292	-.432	-.038	1.000	
C3	-.472	-.162	-.157	.075	-.007	1.000

PSI

C8	C9	C10
.569	.787	.752

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C8	C9	C10
.431	.213	.248

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .604

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C8	C9	C10
C8	.000	.000	.000
C9	.052	.000	.000
C10	.026	.175	.000

GAMMA

	C1	C2	C3
C8	.231	-.386	-.492
C9	-.329	-.285	-.115
C10	.155	-.366	-.131

COVARIANCE MATRIX OF Y AND X

	C8	C9	C10	C1	C2	C3
C8	1.000					
C9	.148	1.000				
C10	.289	.257	1.000			
C1	.209	-.316	.109	1.000		
C2	-.391	-.292	-.432	-.038	1.000	
C3	-.472	-.162	-.157	.075	-.007	1.000

PSI

C8	C9	C10
.569	.787	.752

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C8	C9	C10
.431	.213	.248

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .604

* CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

GOODNESS OF FIT INDEX =1.000
ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C8	C9	C10
C8	.000	.000	.000
C9	.098	.000	.000
C10	.096	.082	.000

GAMMA

	C1	C2	C3
C8	.063	.063	.063
C9	.078	.083	.089
C10	.081	.085	.087

PSI

C8	C9	C10
.067	.093	.089

UNSPECIFIED TITLE

T-VALUES

BETA

	C8	C9	C10
C8	.000	.000	.000
C9	.525	.000	.000
C10	.272	2.135	.000

GAMMA

	C1	C2	C3
C8	3.647	-6.111	-7.778
C9	-4.230	-3.416	-1.297
C10	1.914	-4.311	-1.501

PSI

C8	C9	C10
8.456	8.456	8.456

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C8	.231	-.386	-.492
C9	-.317	-.305	-.140
C10	.105	-.429	-.168

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C8	.063	.063	.063
C9	.074	.074	.074
C10	.074	.074	.074

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C8	.000	.000	.000
C9	.012	-.020	-.025
C10	-.049	-.063	-.037

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C8	.000	.000	.000
C9	.023	.038	.048
C10	.037	.046	.050

TOTAL EFFECTS OF Y ON Y

	C8	C9	C10
C8	.000	.000	.000
C9	.052	.000	.000
C10	.035	.175	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .031

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C8	C9	C10
C8	.000	.000	.000
C9	.098	.000	.000
C10	.098	.082	.000

INDIRECT EFFECTS OF Y ON Y

	C8	C9	C10
C8	.000	.000	.000
C9	.000	.000	.000
C10	.009	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C8	C9	C10
C8	.000	.000	.000
C9	.000	.000	.000
C10	.018	.000	.000

THE PROBLEM USED 6152 BYTES (= 1.2% OF AVAILABLE WORKSPACE)

TIME USED : 1.3 SECONDS

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=15 no=147
->  /se /5 4 6 7 8 9 10 1 2 3/
->  /mo ny=7 nx=3 be=sd ps=di  fi
->  /fix be(4,1) be(6,1) be(7,1) be(5,2) be(6,2) be(7,2)
->  /fix be(7,3) be(6,4)
->  /fix ga(1,2) ga(2,2) ga(3,2) ga(4,2)
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=15 NO=147 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb15.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12       C13       C14       C15
SE
5 4 6 7 8 9 10 1 2 3/
MO NY=7 NX=3 BE=SD PS=DI   FI
FIX BE(4,1) BE(6,1) BE(7,1) BE(5,2) BE(6,2) BE(7,2)
FIX BE(7,3) BE(6,4)
FIX GA(1,2) GA(2,2) GA(3,2) GA(4,2)
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 15

NUMBER OF Y - VARIABLES 7

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 7

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 147

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.196	.711	.314	1.000		
C8	.585	.227	-.024	.241	1.000	
C9	-.138	.248	.479	.257	.148	1.000
C10	.172	.565	.164	.778	.289	.257
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.011	-.109	.152	-.079	-.391	-.292
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX TO BE ANALYZED

	C10	C1	C2	C3
C10	1.000			
C1	.109	1.000		
C2	-.432	-.038	1.000	
C3	-.157	.075	-.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C5	C4	C6	C7	C8	C9
C5	0	0	0	0	0	0
C4	1	0	0	0	0	0
C6	2	3	0	0	0	0
C7	0	4	5	0	0	0
C8	6	0	7	8	0	0
C9	0	0	9	0	10	0
C10	0	0	0	11	12	13

BETA

	C10
C5	0
C4	0
C6	0
C7	0
C8	0
C9	0
C10	0

GAMMA

C1	C2	C3

C5	14	0	15
C4	16	0	17
C6	18	0	19
C7	20	0	21
C8	22	23	24
C9	25	26	27
C10	28	29	30

PSI

C5	C4	C6	C7	C8	C9
31	32	33	34	35	36

PSI

C10
37

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.141	.302	.000	.000	.000	.000
C7	.000	.665	.113	.000	.000	.000
C8	.426	.000	.029	.059	.000	.000
C9	.000	.000	.471	.000	.031	.000
C10	.000	.000	.000	.768	-.087	-.006

BETA

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

GAMMA

	C1	C2	C3
C5	.429	.000	-.558
C4	-.070	.000	-.192
C6	-.181	.000	-.108
C7	.016	.000	-.044
C8	.055	-.385	-.235
C9	-.215	-.360	-.069
C10	.129	-.402	-.016

COVARIANCE MATRIX OF Y AND X

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.195	.711	.314	1.000		
C8	.586	.231	.031	.210	1.000	
C9	-.059	.171	.531	.177	.174	1.050
C10	.162	.528	.202	.749	.264	.220
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.012	.002	.010	.002	-.391	-.359
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX OF Y AND X

	C10	C1	C2	C3
C10	.955			
C1	.109	1.000		
C2	-.369	-.038	1.000	
C3	-.157	.075	-.007	1.000

PSI

C5	C4	C6	C7	C8	C9
.540	.893	.839	.481	.464	.586

PSI

C10
.239

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C5	C4	C6	C7	C8	C9
.460	.107	.161	.519	.536	.442

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10
.750

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .815

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.141	.302	.000	.000	.000	.000
C7	.000	.665	.113	.000	.000	.000
C8	.426	.000	.029	.059	.000	.000
C9	.000	.000	.471	.000	.031	.000
C10	.000	.000	.000	.768	-.087	-.006

BETA

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

GAMMA

	C1	C2	C3
C5	.429	.000	-.558
C4	-.070	.000	-.192
C6	-.181	.000	-.108
C7	.016	.000	-.044
C8	.055	-.385	-.235
C9	-.215	-.360	-.069
C10	.129	-.402	-.016

COVARIANCE MATRIX OF Y AND X

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.195	.711	.314	1.000		
C8	.586	.231	.031	.210	1.000	
C9	-.059	.171	.531	.177	.174	1.050
C10	.162	.528	.202	.749	.264	.220
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.012	.002	.010	.002	-.391	-.359
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX OF Y AND X

	C10	C1	C2	C3
C10	.955			
C1	.109	1.000		
C2	-.369	-.038	1.000	
C3	-.157	.075	-.007	1.000

PSI

C5	C4	C6	C7	C8	C9
.540	.893	.839	.481	.464	.586

PSI

C10
.239

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C5	C4	C6	C7	C8	C9
.460	.107	.161	.519	.536	.442

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10
.750

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .815

CHI-SQUARE WITH 12 DEGREES OF FREEDOM = 14.42 (P = .275)

GOODNESS OF FIT INDEX = .981
ADJUSTED GOODNESS OF FIT INDEX = .914
ROOT MEAN SQUARE RESIDUAL = .039

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -.111
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .142

STEMLEAF PLOT
```
- 1|1
- 0|886555
- 0|43000000000000000000000000000000000
  0|123344
  0|5788
  1|4
```

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -1.599
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = 1.699

STEMLEAF PLOT

```
- 1|66
- 1|4320
- 0|887
- 0|10000000000000000000000000000000
  0|2
  0|668999
  1|022
  1|7
```

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.108	.000	.000	.000	.000	.000
C6	.105	.081	.000	.000	.000	.000
C7	.000	.063	.063	.000	.000	.000
C8	.078	.000	.062	.062	.000	.000
C9	.000	.000	.067	.000	.085	.000
C10	.000	.000	.000	.043	.055	.047

BETA

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

GAMMA

	C1	C2	C3
C5	.062	.000	.062
C4	.092	.000	.099
C6	.089	.000	.098
C7	.060	.000	.061
C8	.067	.057	.073
C9	.069	.072	.077
C10	.046	.049	.050

PSI

C5	C4	C6	C7	C8	C9
.064	.106	.099	.057	.055	.069

PSI

C10
.028

UNSPECIFIED TITLE

T-VALUES

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	1.745	.000	.000	.000	.000	.000
C6	-1.335	3.731	.000	.000	.000	.000
C7	.000	10.500	1.796	.000	.000	.000
C8	5.452	.000	.469	.958	.000	.000
C9	.000	.000	7.081	.000	.370	.000
C10	.000	.000	.000	17.815	-1.593	-.132

BETA

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

GAMMA

	C1	C2	C3
C5	6.961	.000	-9.062
C4	-.763	.000	-1.926
C6	-2.032	.000	-1.104
C7	.266	.000	-.720
C8	.822	-6.764	-3.233
C9	-3.105	-4.999	-.901
C10	2.827	-8.201	-.331

PSI

C5	C4	C6	C7	C8	C9
8.456	8.456	8.456	8.456	8.456	8.456

PSI

C10
8.456

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C5	.429	.000	-.558
C4	.011	.000	-.296
C6	-.238	.000	-.119
C7	-.004	.000	-.254
C8	.231	-.385	-.492
C9	-.320	-.372	-.141
C10	.108	-.366	-.168

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C5	.062	.000	.062
C4	.080	.000	.080
C6	.081	.000	.081
C7	.081	.000	.081
C8	.063	.057	.063
C9	.075	.064	.075
C10	.074	.041	.074

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C5	.000	.000	.000
C4	.081	.000	-.105
C6	-.057	.000	-.011
C7	-.020	.000	-.210
C8	.176	.000	-.257
C9	-.105	-.012	-.072
C10	-.021	.036	-.152

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C5	.000	.000	.000
C4	.048	.000	.061
C6	.051	.000	.065
C7	.059	.000	.059
C8	.045	.000	.053
C9	.046	.033	.057
C10	.065	.027	.068

TOTAL EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.084	.302	.000	.000	.000	.000
C7	.115	.699	.113	.000	.000	.000
C8	.430	.050	.036	.059	.000	.000
C9	-.026	.144	.473	.002	.031	.000
C10	.051	.531	.081	.763	-.087	-.006

TOTAL EFFECTS OF Y ON Y

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .603

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.108	.000	.000	.000	.000	.000
C6	.109	.081	.000	.000	.000	.000
C7	.077	.061	.063	.000	.000	.000
C8	.078	.042	.061	.062	.000	.000
C9	.064	.043	.067	.005	.085	.000
C10	.064	.055	.053	.043	.055	.047

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.057	.000	.000	.000	.000	.000
C7	.115	.034	.000	.000	.000	.000
C8	.004	.050	.007	.000	.000	.000
C9	-.026	.144	.001	.002	.000	.000
C10	.051	.531	.081	-.005	.000	.000

INDIRECT EFFECTS OF Y ON Y

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.036	.000	.000	.000	.000	.000
C7	.077	.021	.000	.000	.000	.000
C8	.012	.042	.008	.000	.000	.000
C9	.064	.043	.004	.005	.000	.000
C10	.064	.055	.053	.006	.002	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C10
C5	.000
C4	.000
C6	.000
C7	.000
C8	.000
C9	.000
C10	.000

THE PROBLEM USED 22920 BYTES (= 4.5% OF AVAILABLE WORKSPACE)

TIME USED : 8.6 SECONDS

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=15 no=147
->  /se /5 4 6 7 8 9 10 11 12 1 2 3/
->  /mo ny=9 nx=3 be=sd ps=di  fi
->  /fix be(4,1) be(6,1) be(7,1) be(5,2) be(6,2) be(7,2)
->  /fix be(7,3) be(6,4)
->  /fix ga(1,2) ga(2,2) ga(3,2) ga(4,2)
->  /fix be(8,1) be(8,2) be(8,3) be(8,4) be(8,5) be(8,7)
->  /fix be(9,1) be(9,2) be(9,3) be(9,5) be(9,6)
->  /fix ga(8,2) ga(9,2)
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=15 NO=147 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb18.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12       C13       C14       C15
SE
5 4 6 7 8 9 10 11 12 1 2 3/
MO NY=9 NX=3 BE=SD PS=DI  FI
FIX BE(4,1) BE(6,1) BE(7,1) BE(5,2) BE(6,2) BE(7,2)
FIX BE(7,3) BE(6,4)
FIX GA(1,2) GA(2,2) GA(3,2) GA(4,2)
FIX BE(8,1) BE(8,2) BE(8,3) BE(8,4) BE(8,5) BE(8,7)
FIX BE(9,1) BE(9,2) BE(9,3) BE(9,5) BE(9,6)
FIX GA(8,2) GA(9,2)
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 15

NUMBER OF Y - VARIABLES 9

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 9

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 147

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.196	.711	.314	1.000		
C8	.585	.227	-.024	.241	1.000	
C9	-.138	.248	.479	.257	.148	1.000
C10	.172	.565	.164	.778	.289	.257
C11	-.059	.177	.255	.275	.156	.509
C12	.142	.449	.110	.650	.290	.257
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.011	-.109	.152	-.079	-.391	-.292
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX TO BE ANALYZED

	C10	C11	C12	C1	C2	C3
C10	1.000					
C11	.296	1.000				
C12	.851	.297	1.000			
C1	.109	-.308	.124	1.000		
C2	-.432	-.264	-.405	-.038	1.000	
C3	-.157	-.058	-.151	.075	-.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C5	C4	C6	C7	C8	C9
C5	0	0	0	0	0	0
C4	1	0	0	0	0	0
C6	2	3	0	0	0	0
C7	0	4	5	0	0	0
C8	6	0	7	8	0	0
C9	0	0	9	0	10	0
C10	0	0	0	11	12	13
C11	0	0	0	0	0	14
C12	0	0	0	15	0	0

BETA

	C10	C11	C12
C5	0	0	0
C4	0	0	0
C6	0	0	0
C7	0	0	0
C8	0	0	0
C9	0	0	0
C10	0	0	0
C11	0	0	0
C12	16	17	0

GAMMA

	C1	C2	C3
C5	18	0	19
C4	20	0	21
C6	22	0	23
C7	24	0	25
C8	26	27	28
C9	29	30	31
C10	32	33	34
C11	35	0	36
C12	37	0	38

PSI

C5	C4	C6	C7	C8	C9
39	40	41	42	43	44

PSI

C10	C11	C12
45	46	47

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.141	.302	.000	.000	.000	.000
C7	.000	.665	.113	.000	.000	.000
C8	.426	.000	.029	.059	.000	.000
C9	.000	.000	.471	.000	.031	.000

C10	.000	.000	.000	.768	-.087	-.006
C11	.000	.000	.000	.000	.000	.906
C12	.000	.000	.000	-.033	.000	.000

BETA

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.845	.071	.000

GAMMA

	C1	C2	C3
C5	.429	.000	-.558
C4	-.070	.000	-.192
C6	-.181	.000	-.108
C7	.016	.000	-.044
C8	.055	-.385	-.235
C9	-.215	-.360	-.069
C10	.129	-.402	-.016
C11	-.029	.000	.091
C12	.055	.000	-.026

COVARIANCE MATRIX OF Y AND X

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.195	.711	.314	1.000		
C8	.586	.231	.031	.210	1.000	
C9	-.059	.171	.531	.177	.174	1.050
C10	.162	.528	.202	.749	.264	.220
C11	-.113	.128	.476	.137	.109	.946
C12	.158	.439	.184	.615	.248	.234
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.012	.002	.010	.002	-.391	-.359
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C1	C2	C3
C10	.955					
C11	.182	1.750				
C12	.805	.258	.960			
C1	.109	-.308	.124	1.000		
C2	-.369	-.324	-.337	-.038	1.000	
C3	-.157	-.058	-.151	.075	-.007	1.000

PSI

C5	C4	C6	C7	C8	C9
.540	.893	.839	.481	.464	.586

PSI

C10	C11	C12
.239	.890	.270

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

.460	.107	.161	.519	.536	.442

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10	C11	C12
.750	.492	.718

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .817

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.141	.302	.000	.000	.000	.000
C7	.000	.665	.113	.000	.000	.000
C8	.426	.000	.029	.059	.000	.000
C9	.000	.000	.471	.000	.031	.000
C10	.000	.000	.000	.768	-.087	-.006
C11	.000	.000	.000	.000	.000	.462
C12	.000	.000	.000	-.033	.000	.000

BETA

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.845	.071	.000

GAMMA

	C1	C2	C3
C5	.429	.000	-.558
C4	-.070	.000	-.192
C6	-.181	.000	-.108
C7	.016	.000	-.044
C8	.055	-.385	-.235
C9	-.215	-.360	-.069
C10	.129	-.402	-.016
C11	-.164	.000	.029
C12	.055	.000	-.026

COVARIANCE MATRIX OF Y AND X

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.195	.711	.314	1.000		
C8	.586	.231	.031	.210	1.000	
C9	-.059	.171	.531	.177	.174	1.050
C10	.162	.528	.202	.749	.264	.220
C11	-.107	.072	.282	.078	.032	.532
C12	.158	.435	.170	.611	.242	.205
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.012	.002	.010	.002	-.391	-.359
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C1	C2	C3
C10	.955					
C11	.079	1.011				
C12	.798	.121	.944			
C1	.109	-.308	.124	1.000		
C2	-.369	-.160	-.325	-.038	1.000	
C3	-.157	-.058	-.151	.075	-.007	1.000

```
PSI

        C5          C4          C6          C7          C8          C9
     --------    --------    --------    --------    --------    --------
         .540        .893        .839        .481        .464        .586

PSI

        C10         C11         C12
     --------    --------    --------
         .239        .716        .270

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

        C5          C4          C6          C7          C8          C9
     --------    --------    --------    --------    --------    --------
         .460        .107        .161        .519        .536        .442

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

        C10         C11         C12
     --------    --------    --------
         .750        .292        .713

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS  IS   .820


 CHI-SQUARE WITH  25 DEGREES OF FREEDOM =    32.65 (P = .140)

              GOODNESS OF FIT INDEX = .964
     ADJUSTED GOODNESS OF FIT INDEX = .887
         ROOT MEAN SQUARE RESIDUAL =       .058


UNSPECIFIED TITLE


SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL =    -.111
  MEDIAN FITTED RESIDUAL =     .000
 LARGEST FITTED RESIDUAL =     .217


STEMLEAF PLOT
- 1|10
- 0|88866555
- 0|4332210000000000000000000000000000000000
  0|11233444
  0|555556788
  1|024
  1|8
  2|02


SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL =   -1.599
  MEDIAN STANDARDIZED RESIDUAL =     .000
 LARGEST STANDARDIZED RESIDUAL =    3.048


STEMLEAF PLOT
- 1|66
- 1|4432110
- 0|98877
- 0|431000000000000000000000000000000000000
  0|23
  0|668899999
  1|022244
  1|57
  2|0
  2|6
  3|00


LARGEST POSITIVE STANDARDIZED RESIDUALS

RESIDUAL FOR      C11 AND      C7 =    2.639
```

C5	.000	.000	.000	.000	.000	.000
C4	1.745	.000	.000	.000	.000	.000
C6	-1.335	3.731	.000	.000	.000	.000
C7	.000	10.500	1.796	.000	.000	.000
C8	5.452	.000	.469	.958	.000	.000
C9	.000	.000	7.081	.000	.370	.000
C10	.000	.000	.000	17.815	-1.593	-.132
C11	.000	.000	.000	.000	.000	6.298
C12	.000	.000	.000	-.467	.000	.000

BETA

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	11.868	1.554	.000

GAMMA

	C1	C2	C3
C5	6.961	.000	-9.062
C4	-.763	.000	-1.926
C6	-2.032	.000	-1.104
C7	.266	.000	-.720
C8	.822	-6.764	-3.233
C9	-3.105	-4.999	-.901
C10	2.827	-8.201	-.331
C11	-2.210	.000	.410
C12	1.166	.000	-.576

PSI

C5	C4	C6	C7	C8	C9
8.456	8.456	8.456	8.456	8.456	8.456

PSI

C10	C11	C12
8.456	8.456	8.456

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C5	.429	.000	-.558
C4	.011	.000	-.296
C6	-.238	.000	-.119
C7	-.004	.000	-.254
C8	.231	-.385	-.492
C9	-.320	-.372	-.141
C10	.108	-.366	-.168
C11	-.312	-.172	-.036
C12	.123	-.321	-.162

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

C1 C2 C3

C5	.062	.000	.062
C4	.080	.000	.080
C6	.081	.000	.081
C7	.081	.000	.081
C8	.063	.057	.063
C9	.075	.064	.075
C10	.074	.041	.074
C11	.079	.040	.079
C12	.075	.044	.075

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C5	.000	.000	.000
C4	.081	.000	-.105
C6	-.057	.000	-.011
C7	-.020	.000	-.210
C8	.176	.000	-.257
C9	-.105	-.012	-.072
C10	-.021	.036	-.152
C11	-.148	-.172	-.065
C12	.069	-.321	-.136

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C5	.000	.000	.000
C4	.048	.000	.061
C6	.051	.000	.065
C7	.059	.000	.059
C8	.045	.000	.053
C9	.046	.033	.057
C10	.065	.027	.068
C11	.042	.040	.036
C12	.063	.044	.062

TOTAL EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.084	.302	.000	.000	.000	.000
C7	.115	.699	.113	.000	.000	.000
C8	.430	.050	.036	.059	.000	.000
C9	-.026	.144	.473	.002	.031	.000
C10	.051	.531	.081	.763	-.087	-.006
C11	-.012	.067	.218	.001	.015	.462
C12	.039	.431	.080	.612	-.073	.028

TOTAL EFFECTS OF Y ON Y

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.845	.071	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .726

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.108	.000	.000	.000	.000	.000
C6	.109	.081	.000	.000	.000	.000
C7	.077	.063	.063	.000	.000	.000

RESIDUAL FOR C11 AND C10 = 3.048

RESIDUAL FOR C12 AND C11 = 3.013

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.108	.000	.000	.000	.000	.000
C6	.105	.081	.000	.000	.000	.000
C7	.000	.063	.063	.000	.000	.000
C8	.078	.000	.062	.062	.000	.000
C9	.000	.000	.067	.000	.085	.000
C10	.000	.000	.000	.043	.055	.047
C11	.000	.000	.000	.000	.000	.073
C12	.000	.000	.000	.070	.000	.000

BETA

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.071	.046	.000

GAMMA

	C1	C2	C3
C5	.062	.000	.062
C4	.092	.000	.099
C6	.089	.000	.098
C7	.060	.000	.061
C8	.067	.057	.073
C9	.069	.072	.077
C10	.046	.049	.050
C11	.074	.000	.072
C12	.047	.000	.045

PSI

C5	C4	C6	C7	C8	C9
.064	.106	.099	.057	.055	.069

PSI

C10	C11	C12
.028	.085	.032

UNSPECIFIED TITLE

T-VALUES

BETA

~~C5~~ C4 C6 C7 C8 C9

C8	.078	.042	.061	.062	.000	.000
C9	.064	.043	.067	.005	.085	.000
C10	.064	.055	.053	.043	.055	.047
C11	.029	.023	.046	.003	.039	.073
C12	.053	.055	.044	.058	.047	.045

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.071	.046	.000

INDIRECT EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.057	.000	.000	.000	.000	.000
C7	.115	.034	.000	.000	.000	.000
C8	.004	.050	.007	.000	.000	.000
C9	-.026	.144	.001	.002	.000	.000
C10	.051	.531	.081	-.005	.000	.000
C11	-.012	.067	.218	.001	.015	.000
C12	.039	.431	.080	.645	-.073	.028

INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.000	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.036	.000	.000	.000	.000	.000
C7	.077	.021	.000	.000	.000	.000
C8	.012	.042	.008	.000	.000	.000
C9	.064	.043	.004	.005	.000	.000
C10	.064	.055	.053	.006	.002	.000
C11	.029	.023	.046	.003	.039	.000
C12	.053	.055	.044	.065	.047	.045

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12
C5	.000	.000	.000
C4	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	~~.000~~	~~.000~~	.000

C11	.000	.000	.000
C12	.000	.000	.000

THE PROBLEM USED 39632 BYTES (= 7.8% OF AVAILABLE WORKSPACE)

TIME USED : 18.9 SECONDS

```
-> lisrel
-> /matrix=in ('path matrix')
-> /da ni=15 no=147
-> /se / 13 14 15 1 3/
-> /mo ny=3 nx=0 be=sd ps=di
-> /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=15 NO=147 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb21.tmp FO
(5E14.6)
LA
 C1       C2       C3       C4       C5       C6       C7       C8
 C9       C10      C11      C12      C13      C14      C15
SE
 13 14 15 1 3/
MO NY=3 NX=0 BE=SD PS=DI
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 15

NUMBER OF Y - VARIABLES 3

NUMBER OF X - VARIABLES 0

NUMBER OF ETA - VARIABLES 3

NUMBER OF KSI - VARIABLES 0

NUMBER OF OBSERVATIONS 147

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C13	C14	C15
C13	1.000		
C14	.189	1.000	
C15	.374	.183	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C13	C14	C15
C13	0	0	0
C14	1	0	0
C15	2	3	0

PSI

C13	C14	C15
4	5	6

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C13	C14	C15
C13	.000	.000	.000
C14	.189	.000	.000
C15	.352	.117	.000

COVARIANCE MATRIX OF Y

	C13	C14	C15
C13	1.000		
C14	.189	1.000	
C15	.374	.183	1.000

PSI

C13	C14	C15
1.000	.964	.847

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C13	C14	C15
.000	.036	.153

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .000

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C13	C14	C15
C13	.000	.000	.000
C14	.189	.000	.000
C15	.352	.117	.000

COVARIANCE MATRIX OF Y

	C13	C14	C15
C13	1.000		
C14	.189	1.000	
C15	.374	.183	1.000

PSI

C13	C14	C15
1.000	.964	.847

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C13	C14	C15
.000	.036	.153

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .000

CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

GOODNESS OF FIT INDEX =1.000
ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C13	C14	C15
C13	.000	.000	.000
C14	.081	.000	.000
C15	.078	.078	.000

PSI

C13	C14	C15
.117	.113	.099

UNSPECIFIED TITLE

T-VALUES

BETA

	C13	C14	C15
C13	.000	.000	.000
C14	2.329	.000	.000
C15	4.539	1.506	.000

PSI

C13	C14	C15
8.544	8.544	8.544

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF Y ON Y

	C13	C14	C15
C13	.000	.000	.000
C14	.189	.000	.000
C15	.374	.117	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .171

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C13	C14	C15
C13	.000	.000	.000
C14	.081	.000	.000
C15	.077	.078	.000

INDIRECT EFFECTS OF Y ON Y

	C13	C14	C15
C13	.000	.000	.000
C14	.000	.000	.000
C15	.022	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C13	C14	C15
C13	.000	.000	.000
C14	.000	.000	.000
C15	.017	.000	.000

THE PROBLEM USED 2096 BYTES (= .4% OF AVAILABLE WORKSPACE)

TIME USED : .7 SECONDS

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=15 no=147
->  /se /5 4 6 7 8 9 10 11 12 13 14 15 1 2 3/
->  /mo ny=12 nx=3 be=sd ps=di  fi
->  /fix be(4,1) be(6,1) be(7,1) be(5,2) be(6,2) be(7,2)
->  /fix be(7,3) be(6,4)
->  /fix ga(1,2) ga(2,2) ga(3,2) ga(4,2)
->  /fix be(8,1) be(8,2) be(8,3) be(8,4) be(8,5) be(8,7)
->  /fix be(9,1) be(9,2) be(9,3) be(9,5) be(9,6)
->  /fix ga(8,2) ga(9,2)
->  /fix be(10,1) be(10,2) be(10,3) be(10,4) be(10,6)
->  /fix be(10,7) be(11,1) be(11,2) be(11,3) be(11,4) be(11,5)
->  /fix be(11,6) be(11,7) be(11,9)
->  /fix be(12,1) be(12,2) be(12,3) be(12,4) be(12,5) be(12,6) be(12,7)
->  /fix be(12,8) ga(10,2) ga(11,2) ga(12,2)
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906

Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=15 NO=147 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb30.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12       C13       C14       C15
SE
5 4 6 7 8 9 10 11 12 13 14 15 1 2 3/
MO NY=12 NX=3 BE=SD PS=DI   FI
FIX BE(4,1) BE(6,1) BE(7,1) BE(5,2) BE(6,2) BE(7,2)
FIX BE(7,3) BE(6,4)
FIX GA(1,2) GA(2,2) GA(3,2) GA(4,2)
FIX BE(8,1) BE(8,2) BE(8,3) BE(8,4) BE(8,5) BE(8,7)
FIX BE(9,1) BE(9,2) BE(9,3) BE(9,5) BE(9,6)
FIX GA(8,2) GA(9,2)
FIX BE(10,1) BE(10,2) BE(10,3) BE(10,4) BE(10,6)
FIX BE(10,7) BE(11,1) BE(11,2) BE(11,3) BE(11,4) BE(11,5)
FIX BE(11,6) BE(11,7) BE(11,9)
FIX BE(12,1) BE(12,2) BE(12,3) BE(12,4) BE(12,5) BE(12,6) BE(12,7)
FIX BE(12,8) GA(10,2) GA(11,2) GA(12,2)
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 15

NUMBER OF Y - VARIABLES 12

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 12

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 147

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.196	.711	.314	1.000		
C8	.585	.227	-.024	.241	1.000	
C9	-.138	.248	.479	.257	.148	1.000
C10	.172	.565	.164	.778	.289	.257
C11	-.059	.177	.255	.275	.156	.509
C12	.142	.449	.110	.650	.290	.257
C13	.531	.230	.015	.274	.843	.213
C14	.004	.149	.152	.176	.222	.378
C15	.183	.385	.115	.580	.323	.232
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.011	-.109	.152	-.079	-.391	-.292
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX TO BE ANALYZED

	C10	C11	C12	C13	C14	C15
C10	1.000					
C11	.296	1.000				
C12	.851	.297	1.000			

C13	.355	.191	.355	1.000		
C14	.135	.639	.170	.189	1.000	
C15	.731	.260	.857	.374	.183	1.000
C1	.109	-.308	.124	.215	-.247	.071
C2	-.432	-.264	-.405	-.407	-.189	-.339
C3	-.157	-.058	-.151	-.491	-.183	-.197

COVARIANCE MATRIX TO BE ANALYZED

	C1	C2	C3
C1	1.000		
C2	-.038	1.000	
C3	.075	-.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C5	C4	C6	C7	C8	C9
C5	0	0	0	0	0	0
C4	1	0	0	0	0	0
C6	2	3	0	0	0	0
C7	0	4	5	0	0	0
C8	6	0	7	8	0	0
C9	0	0	9	0	10	0
C10	0	0	0	11	12	13
C11	0	0	0	0	0	14
C12	0	0	0	15	0	0
C13	0	0	0	0	18	0
C14	0	0	0	0	0	0
C15	0	0	0	0	0	0

BETA

	C10	C11	C12	C13	C14	C15
C5	0	0	0	0	0	0
C4	0	0	0	0	0	0
C6	0	0	0	0	0	0
C7	0	0	0	0	0	0
C8	0	0	0	0	0	0
C9	0	0	0	0	0	0
C10	0	0	0	0	0	0
C11	0	0	0	0	0	0
C12	16	17	0	0	0	0
C13	0	19	20	0	0	0
C14	0	21	0	22	0	0
C15	0	0	23	24	25	0

GAMMA

	C1	C2	C3
C5	26	0	27
C4	28	0	29
C6	30	0	31
C7	32	0	33
C8	34	35	36
C9	37	38	39
C10	40	41	42
C11	43	0	44
C12	45	0	46
C13	47	0	48
C14	49	0	50
C15	51	0	52

PSI

	C5	C4	C6	C7	C8	C9

53	54	55	56	57	58

PSI

C10	C11	C12	C13	C14	C15
59	60	61	62	63	64

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.141	.302	.000	.000	.000	.000
C7	.000	.665	.113	.000	.000	.000
C8	.426	.000	.029	.059	.000	.000
C9	.000	.000	.471	.000	.031	.000
C10	.000	.000	.000	.768	-.087	-.006
C11	.000	.000	.000	.000	.000	.906
C12	.000	.000	.000	-.033	.000	.000
C13	.000	.000	.000	.000	.721	.000
C14	.000	.000	.000	.000	.000	.000
C15	.000	.000	.000	.000	.000	.000

BETA

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.845	.071	.000	.000	.000	.000
C13	.000	.068	.095	.000	.000	.000
C14	.000	.612	.000	.018	.000	.000
C15	.000	.000	.830	.069	.013	.000

GAMMA

	C1	C2	C3
C5	.429	.000	-.558
C4	-.070	.000	-.192
C6	-.181	.000	-.108
C7	.016	.000	-.044
C8	.055	-.385	-.235
C9	-.215	-.360	-.069
C10	.129	-.402	-.016
C11	-.029	.000	.091
C12	.055	.000	-.026
C13	.084	.000	-.139
C14	-.052	.000	-.135
C15	-.041	.000	-.033

COVARIANCE MATRIX OF Y AND X

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.195	.711	.314	1.000		
C8	.586	.231	.031	.210	1.000	
C9	-.059	.171	.531	.177	.174	1.050
C10	.162	.528	.202	.749	.264	.220

C11	-.113	.128	.476	.137	.109	.946
C12	.158	.439	.184	.615	.248	.234
C13	.535	.257	.070	.252	.835	.208
C14	-.009	.123	.324	.124	.134	.620
C15	.169	.394	.177	.539	.273	.235
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.012	.002	.010	.002	-.391	-.359
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C13	C14	C15
C10	.955					
C11	.182	1.750				
C12	.805	.258	.960			
C13	.310	.204	.319	.992		
C14	.132	1.098	.178	.197	1.281	
C15	.692	.257	.821	.343	.194	.968
C1	.109	-.308	.124	.215	-.247	.071
C2	-.369	-.324	-.337	-.338	-.201	-.304
C3	-.157	-.058	-.151	-.491	-.183	-.197

COVARIANCE MATRIX OF Y AND X

	C1	C2	C3
C1	1.000		
C2	-.038	1.000	
C3	.075	-.007	1.000

PSI

C5	C4	C6	C7	C8	C9
.540	.893	.839	.481	.464	.586

.PSI

C10	C11	C12	C13	C14	C15
.239	.890	.270	.259	.569	.257

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C5	C4	C6	C7	C8	C9
.460	.107	.161	.519	.536	.442

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10	C11	C12	C13	C14	C15
.750	.492	.718	.739	.556	.735

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .832

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.141	.302	.000	.000	.000	.000
C7	.000	.665	.113	.000	.000	.000
C8	.426	.000	.029	.059	.000	.000
C9	.000	.000	.471	.000	.031	.000
C10	.000	.000	.000	.768	-.087	-.006
C11	.000	.000	.000	.000	.000	.462
C12	.000	.000	.000	-.033	.000	.000

C13	.000	.000	.000	.000	.721	.000
C14	.000	.000	.000	.000	.000	.000
C15	.000	.000	.000	.000	.000	.000

BETA

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.845	.071	.000	.000	.000	.000
C13	.000	.068	.095	.000	.000	.000
C14	.000	.612	.000	.018	.000	.000
C15	.000	.000	.830	.069	.013	.000

GAMMA

	C1	C2	C3
C5	.429	.000	-.558
C4	-.070	.000	-.192
C6	-.181	.000	-.108
C7	.016	.000	-.044
C8	.055	-.385	-.235
C9	-.215	-.360	-.069
C10	.129	-.402	-.016
C11	-.164	.000	.029
C12	.055	.000	-.026
C13	.084	.000	-.139
C14	-.052	.000	-.135
C15	-.041	.000	-.033

COVARIANCE MATRIX OF Y AND X

	C5	C4	C6	C7	C8	C9
C5	1.000					
C4	.261	1.000				
C6	-.075	.300	1.000			
C7	.195	.711	.314	1.000		
C8	.586	.231	.031	.210	1.000	
C9	-.059	.171	.531	.177	.174	1.050
C10	.162	.528	.202	.749	.264	.220
C11	-.107	.072	.282	.078	.032	.532
C12	.158	.435	.170	.611	.242	.205
C13	.536	.253	.056	.248	.829	.177
C14	-.005	.089	.205	.087	.087	.367
C15	.170	.390	.163	.535	.267	.205
C1	.387	-.012	-.247	-.023	.209	-.316
C2	-.012	.002	.010	.002	-.391	-.359
C3	-.526	-.296	-.137	-.255	-.472	-.162

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C13	C14	C15
C10	.955					
C11	.079	1.011				
C12	.798	.121	.944			
C13	.303	.086	.304	.979		
C14	.069	.643	.093	.125	1.002	
C15	.685	.129	.806	.329	.115	.954
C1	.109	-.308	.124	.215	-.247	.071
C2	-.369	-.160	-.325	-.326	-.100	-.292
C3	-.157	-.058	-.151	-.491	-.183	-.197

COVARIANCE MATRIX OF Y AND X

	C1	C2	C3

```
C1      1.000
C2      -.038     1.000
C3       .075     -.007     1.000

   PSI

          C5        C4        C6        C7        C8        C9
       --------  --------  --------  --------  --------  --------
          .540      .893      .839      .481      .464      .586

   PSI

         C10       C11       C12       C13       C14       C15
       --------  --------  --------  --------  --------  --------


          .239      .716      .270      .259      .569      .257

   SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

          C5        C4        C6        C7        C8        C9
       --------  --------  --------  --------  --------  --------
          .460      .107      .161      .519      .536      .442

   SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

         C10       C11       C12       C13       C14       C15
       --------  --------  --------  --------  --------  --------
          .750      .292      .713      .735      .432      .731

   TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS  IS   .835


    CHI-SQUARE WITH  50 DEGREES OF FREEDOM =    49.91 (P = .477)

               GOODNESS OF FIT INDEX = .957
      ADJUSTED GOODNESS OF FIT INDEX = .897
            ROOT MEAN SQUARE RESIDUAL =     .057


UNSPECIFIED TITLE


SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL =    -.111
  MEDIAN FITTED RESIDUAL =     .000
 LARGEST FITTED RESIDUAL =     .217


STEMLEAF PLOT
-10|14
- 8|9110
- 6|931
- 4|5330771
- 2|87633
- 0|71555320000000000000000000000000000000000000
  0|11991334
  2|1567925779
  4|55566771122366
  6|0567877
  8|09
 10|55
 12|415
 14|2
 16|6
 18|7
 20|7


SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL =   -1.599
  MEDIAN STANDARDIZED RESIDUAL =     .000
 LARGEST STANDARDIZED RESIDUAL =    3.048
```

```
-16|0
-14|90
-12|930
-10|6108
- 8|75522
- 6|64263
- 4|30
- 2|59
- 0|4996100000000000000000000000000000000000000
  0|12679
  2|259
  4|2267
  6|538
  8|00779025
 10|4480355678
 12|0059
 14|2146
 16|0



 18|8
 20|0
 22|02
 24|5
 26|4
 28|
 30|15
```

LARGEST POSITIVE STANDARDIZED RESIDUALS

RESIDUAL FOR C11 AND C7 = 2.639

RESIDUAL FOR C11 AND C10 = 3.048

RESIDUAL FOR C12 AND C11 = 3.013

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.108	.000	.000	.000	.000	.000
C6	.105	.081	.000	.000	.000	.000
C7	.000	.063	.063	.000	.000	.000
C8	.078	.000	.062	.062	.000	.000
C9	.000	.000	.067	.000	.085	.000
C10	.000	.000	.000	.043	.055	.047
C11	.000	.000	.000	.000	.000	.073
C12	.000	.000	.000	.070	.000	.000
C13	.000	.000	.000	.000	.051	.000
C14	.000	.000	.000	.000	.000	.000
C15	.000	.000	.000	.000	.000	.000

BETA

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.071	.046	.000	.000	.000	.000
C13	.000	.045	.046	.000	.000	.000
C14	.000	.067	.000	.078	.000	.000
C15	.000	.000	.046	.054	.045	.000

GAMMA

	C1	C2	C3
C5	.062	.000	.062
C4	.092	.000	.099
C6	.089	.000	.098
C7	.060	.000	.061
C8	.067	.057	.073
C9	.069	.072	.077
C10	.046	.049	.050
C11	.074	.000	.072
C12	.047	.000	.045
C13	.047	.000	.049
C14	.070	.000	.075
C15	.046	.000	.050

PSI

C5	C4	C6	C7	C8	C9
.064	.106	.099	.057	.055	.069

PSI

C10	C11	C12	C13	C14	C15
.028	.085	.032	.031	.067	.030

UNSPECIFIED TITLE

T-VALUES

BETA

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	1.745	.000	.000	.000	.000	.000
C6	-1.335	3.731	.000	.000	.000	.000
C7	.000	10.500	1.796	.000	.000	.000
C8	5.452	.000	.469	.958	.000	.000
C9	.000	.000	7.081	.000	.370	.000
C10	.000	.000	.000	17.815	-1.593	-.132
C11	.000	.000	.000	.000	.000	6.298
C12	.000	.000	.000	-.467	.000	.000
C13	.000	.000	.000	.000	14.098	.000
C14	.000	.000	.000	.000	.000	.000
C15	.000	.000	.000	.000	.000	.000

BETA

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	11.868	1.554	.000	.000	.000	.000
C13	.000	1.503	2.058	.000	.000	.000
C14	.000	9.137	.000	.226	.000	.000
C15	.000	.000	17.968	1.297	.288	.000

GAMMA

	C1	C2	C3
C5	6.961	.000	-9.062
C4	-.763	.000	-1.926

C6	-2.032	.000	-1.104
C7	.266	.000	-.720
C8	.822	-6.764	-3.233
C9	-3.105	-4.999	-.901
C10	2.827	-8.201	-.331
C11	-2.210	.000	.410
C12	1.166	.000	-.576
C13	1.774	.000	-2.808
C14	-.741	.000	-1.809
C15	-.883	.000	-.653

PSI

C5	C4	C6	C7	C8	C9
8.456	8.456	8.456	8.456	8.456	8.456

PSI

C10	C11	C12	C13	C14	C15
8.456	8.456	8.456	8.456	8.456	8.456

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C5	.429	.000	-.558
C4	.011	.000	-.296
C6	-.238	.000	-.119
C7	-.004	.000	-.254
C8	.231	-.385	-.492
C9	-.320	-.372	-.141
C10	.108	-.366	-.168
C11	-.312	-.172	-.036
C12	.123	-.321	-.162
C13	.241	-.320	-.511
C14	-.239	-.111	-.166
C15	.075	-.290	-.205

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C5	.062	.000	.062
C4	.080	.000	.080
C6	.081	.000	.081
C7	.081	.000	.081
C8	.063	.057	.063
C9	.075	.064	.075
C10	.074	.041	.074
C11	.079	.040	.079
C12	.075	.044	.075
C13	.063	.047	.063
C14	.080	.036	.080
C15	.076	.042	.076

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C5	.000	.000	.000
C4	.081	.000	-.105
C6	-.057	.000	-.011
C7	-.020	.000	-.210
C8	.176	.000	-.257
C9	-.105	-.012	-.072
C10	-.021	.036	-.152
C11	-.148	-.172	-.065

C12	.069	-.321	-.136
C13	.157	-.320	-.373
C14	-.187	-.111	-.031
C15	.116	-.290	-.172

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C5	.000	.000	.000
C4	.048	.000	.061
C6	.051	.000	.065
C7	.059	.000	.059
C8	.045	.000	.053
C9	.046	.033	.057
C10	.065	.027	.068
C11	.042	.040	.036
C12	.063	.044	.062
C13	.051	.047	.053
C14	.057	.036	.062
C15	.066	.042	.069

TOTAL EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.188	.000	.000	.000	.000	.000
C6	-.084	.302	.000	.000	.000	.000
C7	.115	.699	.113	.000	.000	.000
C8	.430	.050	.036	.059	.000	.000
C9	-.026	.144	.473	.002	.031	.000
C10	.051	.531	.081	.763	-.087	-.006
C11	-.012	.067	.218	.001	.015	.462
C12	.039	.431	.080	.612	-.073	.028
C13	.313	.082	.048	.101	.716	.034
C14	-.002	.042	.134	.002	.021	.283
C15	.054	.364	.072	.515	-.010	.029

TOTAL EFFECTS OF Y ON Y

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.845	.071	.000	.000	.000	.000
C13	.080	.075	.095	.000	.000	.000
C14	.001	.613	.002	.018	.000	.000
C15	.707	.072	.837	.070	.013	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .741

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.108	.000	.000	.000	.000	.000
C6	.109	.081	.000	.000	.000	.000
C7	.077	.061	.063	.000	.000	.000
C8	.078	.042	.061	.062	.000	.000
C9	.064	.043	.067	.005	.085	.000
C10	.064	.055	.053	.043	.055	.047
C11	.029	.023	.046	.003	.039	.073
C12	.053	.055	.044	.058	.047	.045
C13	.061	.036	.045	.053	.052	.022
C14	.031	.016	.032	.008	.061	.054

C15	.047	.050	.038	.056	.055	.040

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.071	.046	.000	.000	.000	.000
C13	.039	.045	.046	.000	.000	.000
C14	.006	.066	.007	.078	.000	.000
C15	.071	.047	.045	.054	.045	.000

INDIRECT EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.057	.000	.000	.000	.000	.000
C7	.115	.034	.000	.000	.000	.000
C8	.004	.050	.007	.000	.000	.000
C9	-.026	.144	.001	.002	.000	.000
C10	.051	.531	.081	-.005	.000	.000
C11	-.012	.067	.218	.001	.015	.000
C12	.039	.431	.080	.645	-.073	.028
C13	.313	.082	.048	.101	-.006	.034
C14	-.002	.042	.134	.002	.021	.283
C15	.054	.364	.072	.515	-.010	.029

INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.000	.000	.000	.000	.000	.000
C13	.080	.007	.000	.000	.000	.000
C14	.001	.001	.002	.000	.000	.000
C15	.707	.072	.007	.000	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C5	C4	C6	C7	C8	C9
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000
C6	.036	.000	.000	.000	.000	.000
C7	.077	.021	.000	.000	.000	.000
C8	.012	.042	.008	.000	.000	.000
C9	.064	.043	.004	.005	.000	.000
C10	.064	.055	.053	.006	.002	.000
C11	.029	.023	.046	.003	.039	.000
C12	.053	.055	.044	.065	.047	.045
C13	.061	.036	.045	.053	.006	.022
C14	.031	.016	.032	.008	.061	.054
C15	.047	.050	.038	.056	.055	.040

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12	C13	C14	C15
C5	.000	.000	.000	.000	.000	.000
C4	.000	.000	.000	.000	.000	.000

C6	.000	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.000	.000	.000	.000	.000	.000
C9	.000	.000	.000	.000	.000	.000
C10	.000	.000	.000	.000	.000	.000
C11	.000	.000	.000	.000	.000	.000
C12	.000	.000	.000	.000	.000	.000
C13	.039	.005	.000	.000	.000	.000
C14	.006	.006	.007	.000	.000	.000
C15	.071	.047	.006	.001	.000	.000

THE PROBLEM USED 81208 BYTES (= 16.4% OF AVAILABLE WORKSPACE)

TIME USED : 47.7 SECONDS

Appendix 19 Raw data for main study 2

SUBJ	AGE	SEX	TRT	P1	PC1	IM1	P2	PC2	IM2	P3	PC3	IM3
2001	7	1	1	43	4	60	47	5	64	48	6	66
2002	7	1	1	45	4	63	61	7	67	64	7	67
2003	7	1	1	52	5	55	54	4	56	56	5	60
2004	7	1	1	50	4	57	52	6	62	54	6	63
2005	7	1	1	60	7	52	74	7	57	76	7	60
2006	7	1	1	57	4	52	60	5	50	68	5	54
2007	7	1	1	52	4	59	55	5	64	56	5	62
2008	7	1	1	50	3	43	50	4	48	54	5	51
2009	7	1	1	79	4	68	84	6	70	86	7	73
2010	7	1	1	39	5	44	43	4	46	45	4	46
2011	7	1	1	46	6	46	49	7	49	53	7	47
2012	7	1	1	47	4	43	45	6	48	49	6	50
2013	7	1	1	50	5	49	56	5	49	57	5	52
2014	7	1	1	58	7	51	70	7	57	82	7	59
2015	7	1	1	46	4	54	50	5	57	52	6	60
2016	7	1	1	50	3	70	54	4	72	56	5	74
2017	7	1	1	49	6	65	52	7	68	53	7	69
2018	7	1	1	60	5	64	71	5	67	74	6	69
2019	7	1	1	46	5	56	49	6	60	50	7	62
2020	7	1	1	52	4	60	56	5	69	59	6	74
2021	7	1	2	47	4	55	48	4	56	48	5	57
2022	7	1	2	59	5	61	62	4	60	65	4	59
2023	7	1	2	53	5	54	54	6	56	57	6	57
2024	7	1	2	51	4	57	52	5	59	56	6	60
2025	7	1	2	44	4	61	46	5	62	48	6	63
2026	7	1	2	56	7	56	55	7	55	57	7	57
2027	7	1	2	52	3	49	53	4	52	55	4	51
2028	7	1	2	46	4	54	47	4	55	49	4	55
2029	7	1	2	45	4	56	48	4	57	48	5	59
2030	7	1	2	39	4	54	41	5	54	42	5	56
2031	7	1	2	80	7	46	81	7	49	88	7	49
2032	7	1	2	49	5	60	50	5	60	54	5	61
2033	7	1	2	54	4	49	56	5	50	52	5	52
2034	7	1	2	56	6	57	56	6	48	62	6	49
2035	7	1	2	64	5	56	62	6	55	64	7	56
2036	7	1	2	49	5	54	54	5	56	56	7	57
2037	7	1	2	52	5	63	53	6	64	55	7	65
2038	7	1	2	46	4	60	49	4	61	51	5	62
2039	7	1	2	53	5	49	54	6	50	57	6	51
2040	10	1	1	46	3	49	50	4	51	50	5	52
2041	10	1	1	59	4	60	54	5	62	56	6	63
2042	10	1	1	67	5	65	71	5	67	73	6	70
2043	10	1	1	49	3	52	57	6	54	61	7	56
2044	10	1	1	50	4	54	54	4	56	57	5	58
2045	10	1	1	51	4	60	51	5	61	54	6	63
2046	10	1	1	42	5	49	46	6	52	50	7	50
2047	10	1	1	57	4	53	65	5	51	69	6	53
2048	10	1	1	46	3	47	47	4	49	51	4	51
2049	10	1	1	54	4	52	59	5	55	60	6	56
2050	10	1	1	55	2	60	61	4	63	63	5	65
2051	10	1	1	68	3	57	73	5	59	77	6	62
2052	10	1	1	43	5	48	46	5	49	49	6	50
2053	10	1	1	46	4	46	50	5	49	52	6	49
2054	10	1	1	70	5	62	73	6	61	76	7	62
2055	10	1	1	64	7	60	69	7	73	71	7	75
2056	10	1	1	59	5	49	60	6	51	68	6	52
2057	10	1	1	47	6	62	54	6	64	56	7	66
2058	10	1	1	68	7	54	73	7	56	77	7	58
2059	10	1	1	72	7	49	79	7	61	81	7	61
2060	10	1	2	60	5	57	62	5	58	65	5	58
2061	10	1	2	64	7	63	65	7	64	68	7	62
2062	10	1	2	51	5	52	53	6	55	57	6	57
2063	10	1	2	60	3	54	61	3	54	62	4	56
2064	10	1	2	63	5	60	67	5	61	69	5	62
2065	10	1	2	74	6	71	72	6	69	75	6	69
2066	10	1	2	43	3	44	45	4	46	46	6	47
2067	10	1	2	59	6	51	61	6	51	63	7	52

SUBJ	AGE	SEX	TRT	P1	PC1	IM1	P2	PC2	IM2	P3	PC3	IM3
2068	10	1	2	57	4	56	59	5	56	60	5	56
2069	10	1	2	54	5	52	60	5	55	64	5	56
2070	10	1	2	68	6	54	67	6	54	69	5	54
2071	10	1	2	62	4	60	61	5	61	66	6	62
2072	10	1	2	49	3	48	51	5	48	50	5	49
2073	10	1	2	57	7	54	55	7	55	56	7	55
2074	10	1	2	51	4	57	51	4	58	54	4	59
2075	10	1	2	42	3	48	43	5	49	45	5	52
2076	10	1	2	50	5	52	48	5	54	49	5	54
2077	10	1	2	47	5	61	49	5	62	51	5	61
2078	10	1	2	45	4	51	46	4	50	48	6	51
2079	7	2	1	49	4	53	52	5	59	55	5	62
2080	7	2	1	43	4	55	46	5	56	47	6	57
2081	7	2	1	56	5	51	59	6	55	64	7	56
2082	7	2	1	49	4	50	55	6	52	56	7	55
2083	7	2	1	47	4	69	48	5	73	52	5	74
2084	7	2	1	41	4	57	44	4	55	46	5	56
2085	7	2	1	60	7	46	63	7	48	60	7	49
2086	7	2	1	46	4	44	46	5	46	49	6	47
2087	7	2	1	76	7	55	82	7	57	85	7	58
2088	7	2	1	42	5	44	50	6	48	56	5	49
2089	7	2	1	42	4	46	47	5	47	51	6	48
2090	7	2	1	35	3	54	45	4	56	46	5	56
2091	7	2	1	46	4	55	45	5	57	49	5	58
2092	7	2	1	50	5	67	54	6	69	57	6	74
2093	7	2	1	60	6	65	62	7	67	63	7	71
2094	7	2	1	61	5	57	65	5	57	67	7	59
2095	7	2	1	48	4	61	49	6	65	50	6	66
2096	7	2	1	50	5	54	52	5	55	54	6	57
2097	7	2	1	43	3	65	48	4	69	56	5	72
2098	7	2	1	36	4	59	42	5	61	42	7	63
2099	7	2	2	41	4	58	42	4	58	41	4	57
2100	7	2	2	78	7	61	79	7	63	80	7	62
2101	7	2	2	45	4	58	48	5	59	46	5	60
2102	7	2	2	62	5	56	61	6	60	60	6	62
2103	7	2	2	40	2	62	41	3	62	42	4	63
2104	7	2	2	48	4	64	49	4	66	47	4	65
2105	7	2	2	48	4	69	49	5	71	49	5	73
2106	7	2	2	57	5	56	60	5	59	60	4	62
2107	7	2	2	40	2	53	43	3	53	42	4	54
2108	7	2	2	46	4	48	47	4	49	48	4	50
2109	7	2	2	39	3	42	42	4	42	48	5	43
2110	7	2	2	41	4	46	45	5	47	46	5	48
2111	7	2	2	52	5	45	51	5	40	54	5	42
2112	7	2	2	47	4	44	48	5	47	49	6	48
2113	7	2	2	51	5	58	53	5	59	52	5	61
2114	7	2	2	70	7	68	74	7	68	76	7	66
2115	7	2	2	56	6	51	52	6	50	51	6	48
2116	7	2	2	40	4	51	41	4	53	42	4	53
2117	7	2	2	36	1	54	40	2	54	46	3	52
2118	7	2	2	43	5	53	44	5	55	45	5	58
2119	10	2	1	47	4	45	50	4	49	53	5	50
2120	10	2	1	52	4	56	55	5	58	58	6	58
2121	10	2	1	53	7	62	53	7	64	55	7	64
2122	10	2	1	45	4	61	48	5	62	49	5	63
2123	10	2	1	43	4	45	46	5	47	49	5	48
2124	10	2	1	42	5	56	48	6	55	50	7	56
2125	10	2	1	70	7	50	73	7	52	75	7	52
2126	10	2	1	51	4	45	51	5	49	51	6	49
2127	10	2	1	56	5	42	52	6	46	53	6	46
2128	10	2	1	42	5	50	45	5	52	46	5	53
2129	10	2	1	43	4	56	47	5	57	48	5	58
2130	10	2	1	57	6	54	56	7	56	57	7	57
2131	10	2	1	50	4	46	54	4	48	56	6	49
2132	10	2	1	48	2	56	49	3	59	49	5	60
2133	10	2	1	43	2	54	45	3	55	49	4	59
2134	10	2	1	61	4	51	64	5	53	66	6	54

SUBJ	AGE	SEX	TRT	P1	PC1	IM1	P2	PC2	IM2	P3	PC3	IM3
2135	10	2	1	62	3	56	67	5	57	69	5	59
2136	10	2	1	66	5	53	68	5	52	71	5	53
2137	10	2	1	53	4	53	54	4	55	55	5	58
2138	10	2	1	44	3	47	46	3	49	48	4	50
2139	10	2	1	42	3	44	45	5	44	46	5	42
2140	10	2	2	42	4	44	43	4	42	44	4	41
2141	10	2	2	44	5	46	45	5	47	46	4	48
2142	10	2	2	54	7	52	56	7	52	55	7	51
2143	10	2	2	57	4	56	54	4	55	50	5	53
2144	10	2	2	72	7	60	75	6	61	76	6	60
2145	10	2	2	51	5	54	52	6	54	51	6	52
2146	10	2	2	45	4	44	43	5	45	46	5	44
2147	10	2	2	42	3	54	44	4	52	46	4	53
2148	10	2	2	57	5	52	54	5	53	52	6	46
2149	10	2	2	42	4	46	43	5	47	45	4	45
2150	10	2	2	42	2	47	44	3	48	42	3	49
2151	10	2	2	49	4	45	51	4	45	58	2	47
2152	10	2	2	42	5	47	46	5	48	45	6	48
2153	10	2	2	49	4	48	47	4	46	46	4	48
2154	10	2	2	69	6	64	73	6	66	71	6	56
2155	10	2	2	78	6	70	80	7	72	82	7	75
2156	10	2	2	45	5	45	46	5	46	41	5	45
2157	10	2	2	44	4	46	45	4	44	48	3	49
2158	10	2	2	47	4	47	49	4	49	50	4	46
2159	10	2	2	40	4	44	42	4	50	44	4	53

≡sults of MANOVA for main study 2

- -

```
The default error term in MANOVA has been changed from WITHIN CELLS to
WITHIN+RESIDUAL.  Note that these are the same for all full factorial
designs.

>Warning # 12190
>There are one or more completely empty categories for one or more factors
>specified on the MANOVA command.  To run the analysis in this release,
>please recode the values of affected factors to sequential integer values
>and rerun.

MISSING CATEGORIES

VARIABLE     VALUE

C1              10
```

- -

```
The default error term in MANOVA has been changed from WITHIN CELLS to
WITHIN+RESIDUAL.  Note that these are the same for all full factorial
designs.

* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

      159 cases accepted.
        0 cases rejected because of out-of-range factor values.
        0 cases rejected because of missing data.
        8 non-empty cells.

        1 design will be processed.
```

- -

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. C1 BY C2 BY C3
 Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)
```

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01555	.25103	9.00	143.00	.986
Hotellings	.01580	.25103	9.00	143.00	.986
Wilks	.98445	.25103	9.00	143.00	.986
Roys	.01555				

Note.. F statistics are exact.

- -

```
 EFFECT .. C1 BY C2 BY C3 (Cont.)
 Univariate F-tests with (1,151) D. F.
```

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	.58890	13732.4550	.58890	90.94341	.00648	.936
C5	.65043	244.22794	.65043	1.61740	.40214	.527
C6	4.24669	6825.14336	4.24669	45.19962	.09395	.760
C7	1.63820	14460.2267	1.63820	95.76309	.01711	.896
C8	.49732	177.10501	.49732	1.17288	.42402	.516
C9	11.88650	7342.67782	11.88650	48.62701	.24444	.622
C10	3.60867	15645.4674	3.60867	103.61237	.03483	.852
C11	.99797	154.69599	.99797	1.02448	.97413	.325
C12	19.87831	7658.94073	19.87831	50.72146	.39191	.532

- -

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 EFFECT .. C2 BY C3
 Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)
```

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.09275	1.62438	9.00	143.00	.114
Hotellings	.10223	1.62438	9.00	143.00	.114
Wilks	.90725	1.62438	9.00	143.00	.114

Roys .09275
Note.. F statistics are exact.

- -

EFFECT .. C2 BY C3 (Cont.)
Univariate F-tests with (1,151) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	3.28117	13732.4550	3.28117	90.94341	.03608	.850
C5	.17010	244.22794	.17010	1.61740	.10517	.746
C6	8.39979	6825.14336	8.39979	45.19962	.18584	.667
C7	10.31663	14460.2267	10.31663	95.76309	.10773	.743
C8	.17850	177.10501	.17850	1.17288	.15219	.697
C9	1.01023	7342.67782	1.01023	48.62701	.02078	.886
C10	.23206	15645.4674	.23206	103.61237	.00224	.962
C11	2.14250	154.69599	2.14250	1.02448	2.09131	.150
C12	.21324	7658.94073	.21324	50.72146	.00420	.948

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C3
Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.03789	.62578	9.00	143.00	.774
Hotellings	.03938	.62578	9.00	143.00	.774
Wilks	.96211	.62578	9.00	143.00	.774
Roys	.03789				

Note.. F statistics are exact.

- -

EFFECT .. C1 BY C3 (Cont.)
Univariate F-tests with (1,151) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	4.14237	13732.4550	4.14237	90.94341	.04555	.831
C5	1.63618	244.22794	1.63618	1.61740	1.01161	.316
C6	.32240	6825.14336	.32240	45.19962	.00713	.933
C7	.89917	14460.2267	.89917	95.76309	.00939	.923
C8	1.38734	177.10501	1.38734	1.17288	1.18285	.279
C9	5.71144	7342.67782	5.71144	48.62701	.11745	.732
C10	1.94279	15645.4674	1.94279	103.61237	.01875	.891
C11	.00083	154.69599	.00083	1.02448	.00081	.977
C12	4.51694	7658.94073	4.51694	50.72146	.08905	.766

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2
Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.04846	.80915	9.00	143.00	.609
Hotellings	.05093	.80915	9.00	143.00	.609
Wilks	.95154	.80915	9.00	143.00	.609
Roys	.04846				

Note.. F statistics are exact.

- -

EFFECT .. C1 BY C2 (Cont.)
Univariate F-tests with (1,151) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	35.99556	13732.4550	35.99556	90.94341	.39580	.530
C5	.08782	244.22794	.08782	1.61740	.05429	.816
C6	110.10896	6825.14336	110.10896	45.19962	2.43606	.121
C7	45.93444	14460.2267	45.93444	95.76309	.47967	.490
C8	.05409	177.10501	.05409	1.17288	.04612	.830
C9	129.27822	7342.67782	129.27822	48.62701	2.65857	.105
C10	71.96923	15645.4674	71.96923	103.61237	.69460	.406
C11	.94889	154.69599	.94889	1.02448	.92622	.337

C12	181.40627	7658.94073	181.40627	50.72146	3.57652	.061

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C3
Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.46325	13.71301	9.00	143.00	.000
Hotellings	.86306	13.71301	9.00	143.00	.000
Wilks	.53675	13.71301	9.00	143.00	.000
Roys	.46325				

Note.. F statistics are exact.

EFFECT .. C3 (Cont.)
Univariate F-tests with (1,151) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	.29541	13732.4550	.29541	90.94341	.00325	.955
C5	.36904	244.22794	.36904	1.61740	.22817	.634
C6	3.04731	6825.14336	3.04731	45.19962	.06742	.795
C7	229.91775	14460.2267	229.91775	95.76309	2.40090	.123
C8	4.43424	177.10501	4.43424	1.17288	3.78064	.054
C9	188.27742	7342.67782	188.27742	48.62701	3.87187	.051
C10	515.78484	15645.4674	515.78484	103.61237	4.97802	.027
C11	19.71843	154.69599	19.71843	1.02448	19.24732	.000
C12	431.68758	7658.94073	431.68758	50.72146	8.51095	.004

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2
Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.21627	4.38453	9.00	143.00	.000
Hotellings	.27595	4.38453	9.00	143.00	.000
Wilks	.78373	4.38453	9.00	143.00	.000
Roys	.21627				

Note.. F statistics are exact.

EFFECT .. C2 (Cont.)
Univariate F-tests with (1,151) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	607.53647	13732.4550	607.53647	90.94341	6.68038	.011
C5	2.41109	244.22794	2.41109	1.61740	1.49072	.224
C6	158.53702	6825.14336	158.53702	45.19962	3.50749	.063
C7	865.70388	14460.2267	865.70388	95.76309	9.04006	.003
C8	3.96195	177.10501	3.96195	1.17288	3.37797	.068
C9	247.74516	7342.67782	247.74516	48.62701	5.09481	.025
C10	1392.38111	15645.4674	1392.38111	103.61237	13.43837	.000
C11	9.74518	154.69599	9.74518	1.02448	9.51235	.002
C12	370.17455	7658.94073	370.17455	50.72146	7.29818	.008

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1
Multivariate Tests of Significance (S = 1, M = 3 1/2, N = 70 1/2)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.16915	3.23467	9.00	143.00	.001
Hotellings	.20358	3.23467	9.00	143.00	.001
Wilks	.83085	3.23467	9.00	143.00	.001
Roys	.16915				

Note.. F statistics are exact.

EFFECT .. C1 (Cont.)
Univariate F-tests with (1,151) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
C4	290.20632	13732.4550	290.20632	90.94341	3.19106	.076
C5	.03108	244.22794	.03108	1.61740	.01922	.890
C6	228.36968	6825.14336	228.36968	45.19962	5.05247	.026
C7	139.15746	14460.2267	139.15746	95.76309	1.45314	.230
C8	.49732	177.10501	.49732	1.17288	.42402	.516
C9	284.79673	7342.67782	284.79673	48.62701	5.85676	.017
C10	92.18503	15645.4674	92.18503	103.61237	.88971	.347
C11	.99797	154.69599	.99797	1.02448	.97413	.325
C12	457.07221	7658.94073	457.07221	50.72146	9.01142	.003

```
data list file='a:bfm.prn' free records=1/
c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12.
recode c1 (7=8).
manova c4 c5 c6 c7 c8 c9 c10 c11 c12 by c1 (8,9)
 c2 (1,2) c3 (1,2).
```

```
-> data list file='a:bfm.prn' free records=1/
-> c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12.
-> EXECUTE.
-> RECODE
->   c1  (7=1)  (10=2)  .
-> EXECUTE .
-> MANOVA
->   c4  c7  c10  BY c1(1 2) c2(1 2) c3(1 2)
->   /WSFACTORS time(3)
->   /METHOD UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /PRINT
->     SIGNIF( MULT AVERF )
->   /NOPRINT PARAM(ESTIM) .

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

>Error # 12190
>There are one or more completely empty categories for one or more factors
>specified on the MANOVA command.  To run the analysis in this release,
>please recode the values of affected factors to sequential integer values
>and rerun.
>This command not executed.

MISSING CATEGORIES

VARIABLE    VALUE

C1              2
-> data list file='a:bfm.prn' free records=1/
-> c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12.
-> EXECUTE.
-> RECODE
->   c1  (7=1)  (9=2)  .
-> EXECUTE .
-> MANOVA
->   c4  c7  c10  BY c1(1 2) c2(1 2) c3(1 2)
->   /WSFACTORS time(3)
->   /METHOD UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /PRINT
->     SIGNIF( MULT AVERF )
->   /NOPRINT PARAM(ESTIM) .

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

      159 cases accepted.
        0 cases rejected because of out-of-range factor values.
        0 cases rejected because of missing data.
        8 non-empty cells.

        1 design will be processed.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests of Between-Subjects Effects.

 Tests of Significance for T1 using UNIQUE sums of squares
 Source of Variation           SS      DF        MS          F  Sig of F

 WITHIN+RESIDUAL          42598.40     151    282.11
 C1                         492.37       1    492.37       1.75      .188
 C2                        2783.78       1   2783.78       9.87      .002
 C3                         464.52       1    464.52       1.65      .201
 C1 BY C2                   150.67       1    150.67        .53      .466
 C1 BY C3                      .03       1       .03        .00      .992
 C2 BY C3                     1.18       1      1.18        .00      .948
 C1 BY C2 BY C3               5.19       1      5.19        .02      .892
```

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

```
Mauchly sphericity test, W =        .63032
Chi-square approx. =              69.22954 with 2 D. F.
Significance =                        .000

Greenhouse-Geisser Epsilon =        .73010
Huynh-Feldt Epsilon =               .76960
Lower-bound Epsilon =               .50000
```

AVERAGED Tests of Significance that follow multivariate tests are equivalent to univariate or split-plot or mixed-model approach to repeated measures. Epsilons may be used to adjust d.f. for the AVERAGED results.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00073	.05498	2.00	150.00	.947
Hotellings	.00073	.05498	2.00	150.00	.947
Wilks	.99927	.05498	2.00	150.00	.947
Roys	.00073				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.03697	2.87891	2.00	150.00	.059
Hotellings	.03839	2.87891	2.00	150.00	.059
Wilks	.96303	2.87891	2.00	150.00	.059
Roys	.03697				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00820	.62020	2.00	150.00	.539
Hotellings	.00827	.62020	2.00	150.00	.539
Wilks	.99180	.62020	2.00	150.00	.539
Roys	.00820				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

```
Test Name            Value    Exact F Hypoth. DF   Error DF  Sig. of F

Pillais            .00453      .34107       2.00     150.00       .712
Hotellings         .00455      .34107       2.00     150.00       .712
Wilks              .99547      .34107       2.00     150.00       .712
Roys               .00453
Note.. F statistics are exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74 )

Test Name            Value    Exact F Hypoth. DF   Error DF  Sig. of F

Pillais            .22119   21.30103       2.00     150.00       .000
Hotellings         .28401   21.30103       2.00     150.00       .000
Wilks              .77881   21.30103       2.00     150.00       .000
Roys               .22119
Note.. F statistics are exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74 )

Test Name            Value    Exact F Hypoth. DF   Error DF  Sig. of F

Pillais            .09424    7.80378       2.00     150.00       .001
Hotellings         .10405    7.80378       2.00     150.00       .001
Wilks              .90576    7.80378       2.00     150.00       .001
Roys               .09424
Note.. F statistics are exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74 )

Test Name            Value    Exact F Hypoth. DF   Error DF  Sig. of F

Pillais            .02892    2.23396       2.00     150.00       .111
Hotellings         .02979    2.23396       2.00     150.00       .111
Wilks              .97108    2.23396       2.00     150.00       .111
Roys               .02892
Note.. F statistics are exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74 )

Test Name            Value    Exact F Hypoth. DF   Error DF  Sig. of F

Pillais            .61834  121.50804       2.00     150.00       .000
Hotellings        1.62011  121.50804       2.00     150.00       .000
Wilks              .38166  121.50804       2.00     150.00       .000
Roys               .61834
Note.. F statistics are exact.

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

 AVERAGED Tests of Significance for C using UNIQUE sums of squares
 Source of Variation              SS       DF        MS          F  Sig of F

 WITHIN+RESIDUAL             1239.75      302      4.11
 TIME                        1574.85        2    787.42     191.81      .000
 C1 BY TIME                    29.18        2     14.59       3.55      .030
 C2 BY TIME                    81.84        2     40.92       9.97      .000
 C3 BY TIME                   281.48        2    140.74      34.28      .000
 C1 BY C2 BY TIME               3.23        2      1.61        .39      .675
 C1 BY C3 BY TIME               6.95        2      3.48        .85      .430
 C2 BY C3 BY TIME              12.65        2      6.32       1.54      .216
 C1 BY C2 BY C3 BY TI            .64        2       .32        .08      .925
 ME

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
-> MANOVA
->   c5  c8  c11  BY c1(1 2) c2(1 2) c3(1 2)
->   /WSFACTORS time(3)
->   /METHOD UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /PRINT
->     SIGNIF( MULT AVERF )
->   /NOPRINT PARAM(ESTIM) .

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
 * * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

       159 cases accepted.
         0 cases rejected because of out-of-range factor values.
         0 cases rejected because of missing data.
         8 non-empty cells.

         1 design will be processed.

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
 * * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 Tests of Between-Subjects Effects.

  Tests of Significance for T1 using UNIQUE sums of squares
  Source of Variation              SS       DF        MS          F  Sig of F

  WITHIN+RESIDUAL              486.30      151      3.22
  C1                             1.18        1      1.18        .37      .546
  C2                            14.81        1     14.81       4.60      .034
  C3                            11.76        1     11.76       3.65      .058
  C1 BY C2                        .28        1       .28        .09      .770
  C1 BY C3                       2.06        1      2.06        .64      .425
  C2 BY C3                       1.76        1      1.76        .55      .461
  C1 BY C2 BY C3                 2.10        1      2.10        .65      .421

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

```
 * * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

 Tests involving 'TIME' Within-Subject Effect.


  Mauchly sphericity test, W =        .71934
  Chi-square approx. =              49.41352 with 2 D. F.
  Significance =                        .000
```

Greenhouse-Geisser Epsilon = .78085
Huynh-Feldt Epsilon = .82412
Lower-bound Epsilon = .50000

AVERAGED Tests of Significance that follow multivariate tests are equivalent to univariate or split-plot or mixed-model approach to repeated measures. Epsilons may be used to adjust d.f. for the AVERAGED results.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00160	.12012	2.00	150.00	.887
Hotellings	.00160	.12012	2.00	150.00	.887
Wilks	.99840	.12012	2.00	150.00	.887
Roys	.00160				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01762	1.34516	2.00	150.00	.264
Hotellings	.01794	1.34516	2.00	150.00	.264
Wilks	.98238	1.34516	2.00	150.00	.264
Roys	.01762				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02141	1.64077	2.00	150.00	.197
Hotellings	.02188	1.64077	2.00	150.00	.197
Wilks	.97859	1.64077	2.00	150.00	.197
Roys	.02141				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s o f V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01244	.94478	2.00	150.00	.391
Hotellings	.01260	.94478	2.00	150.00	.391
Wilks	.98756	.94478	2.00	150.00	.391
Roys	.01244				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.15703	13.97084	2.00	150.00	.000
Hotellings	.18628	13.97084	2.00	150.00	.000
Wilks	.84297	13.97084	2.00	150.00	.000
Roys	.15703				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02281	1.75088	2.00	150.00	.177
Hotellings	.02335	1.75088	2.00	150.00	.177
Wilks	.97719	1.75088	2.00	150.00	.177
Roys	.02281				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00514	.38740	2.00	150.00	.679
Hotellings	.00517	.38740	2.00	150.00	.679
Wilks	.99486	.38740	2.00	150.00	.679
Roys	.00514				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.54455	89.67266	2.00	150.00	.000
Hotellings	1.19564	89.67266	2.00	150.00	.000
Wilks	.45545	89.67266	2.00	150.00	.000
Roys	.54455				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

AVERAGED Tests of Significance for C using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	89.73	302	.30		
TIME	81.76	2	40.88	137.58	.000
C1 BY TIME	.35	2	.17	.58	.558

C2 BY TIME	1.31	2	.66	2.21	.112
C3 BY TIME	12.77	2	6.38	21.48	.000
C1 BY C2 BY TIME	.81	2	.41	1.37	.255
C1 BY C3 BY TIME	.96	2	.48	1.62	.199
C2 BY C3 BY TIME	.73	2	.36	1.23	.294
C1 BY C2 BY C3 BY TIME	.04	2	.02	.07	.928

- -

```
-> MANOVA
->   c6  c9  c12  BY c1(1 2) c2(1 2) c3(1 2)
->   /WSFACTORS time(3)
->   /METHOD UNIQUE
->   /ERROR WITHIN+RESIDUAL
->   /PRINT
->     SIGNIF( MULT AVERF )
->   /NOPRINT PARAM(ESTIM) .
```

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e * * * * * *

159 cases accepted.
0 cases rejected because of out-of-range factor values.
0 cases rejected because of missing data.
8 non-empty cells.

1 design will be processed.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests of Between-Subjects Effects.

Tests of Significance for T1 using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	21060.79	151	139.48		
C1	949.35	1	949.35	6.81	.010
C2	754.33	1	754.33	5.41	.021
C3	437.88	1	437.88	3.14	.078
C1 BY C2	416.12	1	416.12	2.98	.086
C1 BY C3	8.61	1	8.61	.06	.804
C2 BY C3	1.85	1	1.85	.01	.908
C1 BY C2 BY C3	33.11	1	33.11	.24	.627

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

Mauchly sphericity test, W = .73817
Chi-square approx. = 45.53754 with 2 D. F.
Significance = .000

Greenhouse-Geisser Epsilon = .79250
Huynh-Feldt Epsilon = .83664
Lower-bound Epsilon = .50000

AVERAGED Tests of Significance that follow multivariate tests are equivalent to univariate or split-plot or mixed-model approach to repeated measures.
Epsilons may be used to adjust d.f. for the AVERAGED results.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00511	.38545	2.00	150.00	.681
Hotellings	.00514	.38545	2.00	150.00	.681
Wilks	.99489	.38545	2.00	150.00	.681
Roys	.00511				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C2 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.02453	1.88614	2.00	150.00	.155
Hotellings	.02515	1.88614	2.00	150.00	.155
Wilks	.97547	1.88614	2.00	150.00	.155
Roys	.02453				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.00468	.35278	2.00	150.00	.703
Hotellings	.00470	.35278	2.00	150.00	.703
Wilks	.99532	.35278	2.00	150.00	.703
Roys	.00468				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C1 BY C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.01097	.83219	2.00	150.00	.437
Hotellings	.01110	.83219	2.00	150.00	.437
Wilks	.98903	.83219	2.00	150.00	.437
Roys	.01097				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design   1 * * * * * *

EFFECT .. C3 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.24346	24.13537	2.00	150.00	.000
Hotellings	.32180	24.13537	2.00	150.00	.000
Wilks	.75654	24.13537	2.00	150.00	.000

Roys .24346
Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C2 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.04078	3.18841	2.00	150.00	.044
Hotellings	.04251	3.18841	2.00	150.00	.044
Wilks	.95922	3.18841	2.00	150.00	.044
Roys	.04078				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. C1 BY TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.04800	3.78157	2.00	150.00	.025
Hotellings	.05042	3.78157	2.00	150.00	.025
Wilks	.95200	3.78157	2.00	150.00	.025
Roys	.04800				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

EFFECT .. TIME
Multivariate Tests of Significance (S = 1, M = 0, N = 74)

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	.47756	68.55774	2.00	150.00	.000
Hotellings	.91410	68.55774	2.00	150.00	.000
Wilks	.52244	68.55774	2.00	150.00	.000
Roys	.47756				

Note.. F statistics are exact.

- -

* * * * * * A n a l y s i s   o f   V a r i a n c e -- design 1 * * * * * *

Tests involving 'TIME' Within-Subject Effect.

AVERAGED Tests of Significance for C using UNIQUE sums of squares

Source of Variation	SS	DF	MS	F	Sig of F
WITHIN+RESIDUAL	765.97	302	2.54		
TIME	526.60	2	263.30	103.81	.000
C1 BY TIME	20.89	2	10.45	4.12	.017
C2 BY TIME	22.12	2	11.06	4.36	.014
C3 BY TIME	185.13	2	92.57	36.50	.000
C1 BY C2 BY TIME	4.68	2	2.34	.92	.399
C1 BY C3 BY TIME	1.94	2	.97	.38	.683
C2 BY C3 BY TIME	7.77	2	3.89	1.53	.218
C1 BY C2 BY C3 BY TI ME	2.90	2	1.45	.57	.565

- -

```
-> data list file='c:\winword\statcons\choi\bfm\bfm.prn' free records=1/
-> c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12.
-> prelis
->  /variables c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12 (co)
->  /type=corr
->  /matrix=out ('path matrix').
```

P R E L I S 1.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING PRELIS CONTROL LINES HAVE BEEN READ :

```
SPSS for MS WINDOWS Release 6.0;
DA NI=12 NO=0 MI= -0.989898D+37 MC=1 TR=LI
LA
  C1        C2        C3        C4        C5        C6        C7        C8        C9
RA FI=c:\windows\temp\spssb48.tmp
CO C1
CO C2
CO C3
CO C4
CO C5
CO C6
CO C7
CO C8
CO C9
CO C10
CO C11
CO C12
OU MA=KM SM=c:\windows\temp\spssb49.tmp
```

TOTAL SAMPLE SIZE = 159

UNIVARIATE SUMMARY STATISTICS FOR CONTINUOUS VARIABLES

VARIABLE	MEAN	ST. DEV.	SKEWNESS	KURTOSIS	MINIMUM	FREQ.	MAXIMUM	FREQ.
C1	8.006	1.003	-.013	-1.987	7.000	79	9.000	80
C2	1.509	.501	-.038	-1.986	1.000	78	2.000	81
C3	1.491	.501	.038	-1.986	1.000	81	2.000	78
C4	51.799	9.635	.906	.407	35.000	1	80.000	1
C5	4.528	1.257	.274	.091	1.000	1	7.000	17
C6	54.038	6.819	.315	-.490	42.000	2	71.000	1
C7	54.289	9.987	1.031	.408	40.000	1	84.000	1
C8	5.132	1.091	.059	-.341	2.000	1	7.000	22
C9	55.667	7.214	.374	-.413	40.000	1	73.000	2
C10	56.252	10.594	.992	.359	41.000	2	88.000	1
C11	5.541	1.095	-.325	-.372	2.000	1	7.000	37
C12	56.597	7.606	.419	-.188	41.000	1	75.000	2

SPSS for MS WINDOWS Release 6.0;

ESTIMATED CORRELATION MATRIX

	C1	C2	C3	C4	C5	C6
C1	1.000					
C2	.006	1.000				
C3	-.006	.007	1.000			
C4	.139	-.203	.002	1.000		
C5	-.013	-.098	.038	.584	1.000	
C6	-.180	-.148	-.020	.350	.153	1.000
C7	.092	-.236	-.122	.954	.570	.371
C8	-.053	-.147	-.154	.552	.825	.192
C9	-.189	-.177	-.150	.352	.174	.944
C10	.070	-.282	-.172	.920	.545	.342
C11	-.072	-.228	-.325	.472	.619	.246
C12	-.227	-.205	-.217	.318	.124	.909

ESTIMATED CORRELATION MATRIX

	C7	C8	C9	C10	C11	C12
C7	1.000					
C8	.571	1.000				
C9	.400	.253	1.000			
C10	.977	.561	.376	1.000		
C11	.518	.814	.310	.506	1.000	
C12	.378	.221	.970	.369	.291	1.000

THE PROBLEM USED 48912 BYTES (= 9.5% OF AVAILABLE WORKSPACE)

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=12 no=159
->  /se /8 9 1 2 3/
->  /mo ny=2 nx=3 be=sd ps=di  fi
->   /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=12 NO=159 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb51.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12
SE
8 9 1 2 3/
MO NY=2 NX=3 BE=SD PS=DI  FI
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 12

NUMBER OF Y - VARIABLES 2

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 2

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 159

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C8	C9	C1	C2	C3
C8	1.000				
C9	.253	1.000			
C1	-.053	-.189	1.000		
C2	-.147	-.177	.006	1.000	
C3	-.154	-.150	-.006	.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C8	C9
C8	0	0
C9	1	0

GAMMA

	C1	C2	C3
C8	2	3	4
C9	5	6	7

PSI

C8	C9
8	9

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C8	C9
C8	.000	.000
C9	.204	.000

GAMMA

	C1	C2	C3
C8	-.053	-.145	-.153
C9	-.179	-.145	-.119

COVARIANCE MATRIX OF Y AND X

	C8	C9	C1	C2	C3
C8	1.000				
C9	.253	1.000			
C1	-.053	-.189	1.000		
C2	-.147	-.177	.006	1.000	
C3	-.154	-.150	-.006	.007	1.000

PSI

C8	C9
.952	.871

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C8	C9
.048	.129

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .114

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C8	C9
C8	.000	.000
C9	.204	.000

GAMMA

	C1	C2	C3
C8	-.053	-.145	-.153
C9	-.179	-.145	-.119

COVARIANCE MATRIX OF Y AND X

	C8	C9	C1	C2	C3
C8	1.000				
C9	.253	1.000			
C1	-.053	-.189	1.000		
C2	-.147	-.177	.006	1.000	
C3	-.154	-.150	-.006	.007	1.000

PSI

C8	C9
.952	.871

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C8	C9
.048	.129

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .114

CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

GOODNESS OF FIT INDEX =1.000
ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C8	C9
C8	.000	.000
C9	.077	.000

GAMMA

	C1	C2	C3
C8	.078	.078	.078
C9	.075	.076	.076

PSI

C8	C9
.108	.099

UNSPECIFIED TITLE

T-VALUES

BETA

	C8	C9
C8	.000	.000
C9	2.658	.000

GAMMA

	C1	C2	C3
C8	-.674	-1.856	-1.954
C9	-2.378	-1.911	-1.571

PSI

C8	C9
8.803	8.803

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C8	-.053	-.145	-.153
C9	-.189	-.175	-.150

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C8	.078	.078	.078
C9	.077	.077	.077

INDIRECT EFFECTS OF X ON Y

C1 C2 C3

```
C8        .000        .000        .000
C9       -.011       -.030       -.031

   STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

            C1          C2          C3
         --------    --------    --------
C8        .000        .000        .000
C9        .017        .020        .020

   TOTAL EFFECTS OF Y ON Y

            C8          C9
         --------    --------
C8        .000        .000
C9        .204        .000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS    .042

   STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

            C8          C9
         --------    --------
C8        .000        .000
C9        .077        .000

   INDIRECT EFFECTS OF Y ON Y

            C8          C9
         --------    --------
C8        .000        .000



C9        .000        .000

   STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

            C8          C9
         --------    --------
C8        .000        .000
C9        .000        .000

    THE PROBLEM USED     4080 BYTES (=   .8% OF AVAILABLE WORKSPACE)

                   TIME USED :      .7 SECONDS


-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=12 no=159
->  /se /7 8 9 1 2 3/
->  /mo ny=3 nx=3 be=sd ps=di  fi
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=12 NO=159 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb54.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12
SE
7 8 9 1 2 3/
MO NY=3 NX=3 BE=SD PS=DI   FI
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 12

NUMBER OF Y - VARIABLES 3

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 3

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 159

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C7	C8	C9	C1	C2	C3
C7	1.000					
C8	.571	1.000				
C9	.400	.253	1.000			
C1	.092	-.053	-.189	1.000		
C2	-.236	-.147	-.177	.006	1.000	
C3	-.122	-.154	-.150	-.006	.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C7	C8	C9
C7	0	0	0
C8	1	0	0
C9	2	3	0

GAMMA

	C1	C2	C3
C7	4	5	6
C8	7	8	9
C9	10	11	12

PSI

C7	C8	C9
13	14	15

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C7	C8	C9
C7	.000	.000	.000
C8	.567	.000	.000
C9	.396	-.013	.000

GAMMA

	C1	C2	C3
C7	.093	-.235	-.120
C8	-.105	-.012	-.085
C9	-.227	-.083	-.105

COVARIANCE MATRIX OF Y AND X

	C7	C8	C9	C1	C2	C3
C7	1.000					
C8	.571	1.000				
C9	.400	.253	1.000			
C1	.092	-.053	-.189	1.000		
C2	-.236	-.147	-.177	.006	1.000	
C3	-.122	-.154	-.150	-.006	.007	1.000

PSI

C7	C8	C9
.921	.656	.771

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C7	C8	C9
.079	.344	.229

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .176

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C7	C8	C9
C7	.000	.000	.000
C8	.567	.000	.000
C9	.396	-.013	.000

GAMMA

	C1	C2	C3
C7	.093	-.235	-.120
C8	-.105	-.012	-.085
C9	-.227	-.083	-.105

COVARIANCE MATRIX OF Y AND X

	C7	C8	C9	C1	C2	C3
C7	1.000					
C8	.571	1.000				
C9	.400	.253	1.000			
C1	.092	-.053	-.189	1.000		
C2	-.236	-.147	-.177	.006	1.000	
C3	-.122	-.154	-.150	-.006	.007	1.000

PSI

C7	C8	C9
.921	.656	.771

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C7	C8	C9
.079	.344	.229

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .176

CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

GOODNESS OF FIT INDEX =1.000
ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C7	C8	C9
C7	.000	.000	.000
C8	.068	.000	.000
C9	.089	.087	.000

GAMMA

	C1	C2	C3
C7	.077	.077	.077
C8	.065	.067	.066
C9	.071	.073	.071

PSI

C7	C8	C9
.105	.075	.088

UNSPECIFIED TITLE

T-VALUES

BETA

	C7	C8	C9
C7	.000	.000	.000
C8	8.370	.000	.000
C9	4.474	-.152	.000

GAMMA

C1	C2	C3

C7	1.203	-3.053	-1.555
C8	-1.614	-.179	-1.299
C9	-3.173	-1.145	-1.469

PSI

C7	C8	C9
8.803	8.803	8.803

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C7	.093	-.235	-.120
C8	-.053	-.145	-.153
C9	-.189	-.175	-.150

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C7	.077	.077	.077
C8	.078	.078	.078
C9	.077	.077	.077

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C7	.000	.000	.000
C8	.053	-.134	-.068
C9	.037	-.091	-.045

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C7	.000	.000	.000
C8	.044	.047	.044
C9	.032	.035	.032

TOTAL EFFECTS OF Y ON Y

	C7	C8	C9
C7	.000	.000	.000
C8	.567	.000	.000
C9	.389	-.013	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .479

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C7	C8	C9
C7	.000	.000	.000
C8	.068	.000	.000
C9	.073	.087	.000

INDIRECT EFFECTS OF Y ON Y

	C7	C8	C9
C7	.000	.000	.000
C8	.000	.000	.000
C9	-.008	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C7	C8	C9
C7	.000	.000	.000
C8	.000	.000	.000
C9	.049	.000	.000

THE PROBLEM USED 6152 BYTES (= 1.2% OF AVAILABLE WORKSPACE)

TIME USED : 1.3 SECONDS

```
-> lisrel
-> /matrix=in ('path matrix')
-> /da ni=12 no=159
-> /se /4 5 6 7 8 9 1 2 3/
-> /mo ny=6 nx=3 be=sd ps=di  fi
-> /fix be(5,1) be(6,1) be(4,2) be(6,2) be(4,3) be(5,3)
-> /fix ga(1,3) ga(2,3) ga(3,3)
-> /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=12 NO=159 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb57.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12
SE
4 5 6 7 8 9 1 2 3/
MO NY=6 NX=3 BE=SD PS=DI  FI
FIX BE(5,1) BE(6,1) BE(4,2) BE(6,2) BE(4,3) BE(5,3)
FIX GA(1,3) GA(2,3) GA(3,3)
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 12

NUMBER OF Y - VARIABLES 6

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 6

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 159

COVARIANCE MATRIX TO BE ANALYZED

	C4	C5	C6	C7	C8	C9
C4	1.000					
C5	.584	1.000				
C6	.350	.153	1.000			
C7	.954	.570	.371	1.000		
C8	.552	.825	.192	.571	1.000	
C9	.352	.174	.944	.400	.253	1.000
C1	.139	-.013	-.180	.092	-.053	-.189
C2	-.203	-.098	-.148	-.236	-.147	-.177
C3	.002	.038	-.020	-.122	-.154	-.150

COVARIANCE MATRIX TO BE ANALYZED

	C1	C2	C3
C1	1.000		
C2	.006	1.000	
C3	-.006	.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C4	C5	C6	C7	C8	C9
C4	0	0	0	0	0	0
C5	1	0	0	0	0	0
C6	2	3	0	0	0	0
C7	4	0	0	0	0	0
C8	0	5	0	6	0	0
C9	0	0	7	8	9	0

GAMMA

	C1	C2	C3
C4	10	11	0
C5	12	13	0
C6	14	15	0
C7	16	17	18
C8	19	20	21
C9	22	23	24

PSI

C4	C5	C6	C7	C8	C9
25	26	27	28	29	30

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.603	.000	.000	.000	.000	.000
C6	.434	-.111	.000	.000	.000	.000
C7	.952	.000	.000	.000	.000	.000
C8	.000	.765	.000	.108	.000	.000
C9	.000	.000	.919	.015	.043	.000

GAMMA

C1	C2	C3

C4	.140	-.204	.000
C5	-.097	.024	.000
C6	-.241	-.070	.000
C7	-.041	-.042	-.124
C8	-.054	-.045	-.170
C9	-.024	-.030	-.123

COVARIANCE MATRIX OF Y AND X

	C4	C5	C6	C7	C8	C9
C4	1.000					
C5	.584	1.000				
C6	.350	.153	1.000			
C7	.955	.561	.347	1.001		
C8	.552	.831	.171	.564	1.009	
C9	.363	.188	.940	.378	.237	.993
C1	.139	-.013	-.180	.092	-.053	-.189
C2	-.203	-.098	-.148	-.236	-.147	-.177
C3	-.002	-.001	.000	-.126	-.184	-.133

COVARIANCE MATRIX OF Y AND X

	C1	C2	C3
C1	1.000		
C2	.006	1.000	
C3	-.006	.007	1.000

PSI

C4	C5	C6	C7	C8	C9
.939	.649	.811	.071	.271	.087

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C4	C5	C6	C7	C8	C9
.061	.351	.189	.929	.731	.912

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .455

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.603	.000	.000	.000	.000	.000
C6	.434	-.111	.000	.000	.000	.000
C7	.952	.000	.000	.000	.000	.000
C8	.000	.765	.000	.108	.000	.000
C9	.000	.000	.919	.015	.043	.000

GAMMA

	C1	C2	C3
C4	.140	-.204	.000
C5	-.097	.024	.000
C6	-.241	-.070	.000
C7	-.041	-.042	-.124
C8	-.054	-.045	-.170
C9	-.024	-.030	-.123

COVARIANCE MATRIX OF Y AND X

	C4	C5	C6	C7	C8	C9
C4	1.000					

C5	.584	1.000				
C6	.350	.153	1.000			
C7	.955	.561	.347	1.001		
C8	.552	.831	.171	.564	1.009	
C9	.363	.188	.940	.378	.237	.993
C1	.139	-.013	-.180	.092	-.053	-.189
C2	-.203	-.098	-.148	-.236	-.147	-.177
C3	-.002	-.001	.000	-.126	-.184	-.133

COVARIANCE MATRIX OF Y AND X

	C1	C2	C3
C1	1.000		
C2	.006	1.000	
C3	-.006	.007	1.000

PSI

C4	C5	C6	C7	C8	C9
.939	.649	.811	.071	.271	.087

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C4	C5	C6	C7	C8	C9
.061	.351	.189	.929	.731	.912

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .455

CHI-SQUARE WITH 9 DEGREES OF FREEDOM = 5.83 (P = .757)

GOODNESS OF FIT INDEX = .992
ADJUSTED GOODNESS OF FIT INDEX = .960
ROOT MEAN SQUARE RESIDUAL = .011

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -.020
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .039

```
STEMLEAF PLOT
- 2|0
- 1|741
- 0|9611000000000000000000000000
  0|444679
  1|6
  2|224
  3|09
```

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -.856
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = 1.073

```
STEMLEAF PLOT
- 8|61
- 6|
- 4|
- 2|7452
- 0|5510000000000000000000000
  0|56
  2|601
  4|03783
  6|
```

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.067	.000	.000	.000	.000	.000
C6	.092	.090	.000	.000	.000	.000
C7	.022	.000	.000	.000	.000	.000
C8	.000	.051	.000	.053	.000	.000
C9	.000	.000	.026	.031	.029	.000

GAMMA

	C1	C2	C3
C4	.078	.078	.000
C5	.065	.066	.000
C6	.074	.074	.000
C7	.022	.022	.021
C8	.042	.043	.042
C9	.025	.025	.024

PSI

C4	C5	C6	C7	C8	C9
.107	.074	.092	.008	.031	.010

UNSPECIFIED TITLE

T-VALUES

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	9.025	.000	.000	.000	.000	.000
C6	4.712	-1.236	.000	.000	.000	.000
C7	43.161	.000	.000	.000	.000	.000
C8	.000	15.027	.000	2.053	.000	.000
C9	.000	.000	35.154	.484	1.483	.000

GAMMA

	C1	C2	C3
C4	1.801	-2.614	.000
C5	-1.477	.369	.000
C6	-3.272	-.941	.000
C7	-1.885	-1.909	-5.808
C8	-1.276	-1.035	-4.009
C9	-.980	-1.210	-5.094

PSI

C4	C5	C6	C7	C8	C9
8.803	8.803	8.803	8.803	8.803	8.803

UNSPECIFIED TITLE

TOTAL AND ~~INDIRECT EFFECTS~~

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C4	.140	-.204	.000
C5	-.012	-.098	.000
C6	-.179	-.147	.000
C7	.093	-.235	-.124
C8	-.053	-.145	-.183
C9	-.189	-.175	-.133

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C4	.078	.078	.000
C5	.080	.080	.000
C6	.078	.078	.000
C7	.077	.077	.021
C8	.078	.078	.042
C9	.077	.077	.024

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C4	.000	.000	.000
C5	.084	-.123	.000
C6	.062	-.078	.000
C7	.133	-.194	.000
C8	.001	-.101	-.013
C9	-.165	-.145	-.010

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C4	.000	.000	.000
C5	.048	.049	.000
C6	.032	.033	.000
C7	.074	.074	.000
C8	.066	.067	.007
C9	.073	.073	.005

TOTAL EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.603	.000	.000	.000	.000	.000
C6	.368	-.111	.000	.000	.000	.000
C7	.952	.000	.000	.000	.000	.000
C8	.564	.765	.000	.108	.000	.000
C9	.376	-.069	.919	.020	.043	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS 1.460

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.067	.000	.000	.000	.000	.000
C6	.075	.090	.000	.000	.000	.000
C7	.022	.000	.000	.000	.000	.000
C8	.066	.051	.000	.053	.000	.000
C9	.073	.085	.026	.030	.029	.000

INDIRECT EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.000	.000	.000	.000	.000	.000
C6	-.067	.000	.000	.000	.000	.000

C7	.000	.000	.000	.000	.000	.000
C8	.564	.000	.000	.000	.000	.000
C9	.376	-.069	.000	.005	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.000	.000	.000	.000	.000	.000
C6	.055	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.066	.000	.000	.000	.000	.000
C9	.073	.085	.000	.004	.000	.000

THE PROBLEM USED 16976 BYTES (= 3.3% OF AVAILABLE WORKSPACE)

TIME USED : 6.2 SECONDS

```
-> lisrel
-> /matrix=in ('path matrix')
-> /da ni=12 no=159
-> /se /4 5 6 7 8 9 10 11 12 1 2 3/
-> /mo ny=9 nx=3 be=sd ps=di  fi
-> /fix be(5,1) be(6,1) be(4,2) be(6,2) be(4,3) be(5,3)
-> /fix be(7,1) be(8,1) be(9,1) be(7,2) be(8,2) be(9,2)
-> /fix be(7,3) be(8,3) be(9,3) be(8,4) be(9,4)
-> /fix be(7,5) be(9,5) be(7,6) be(8,6)
-> /fix ga(1,3) ga(2,3) ga(3,3) ga(7,3) ga(8,3) ga(9,3)
-> /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=12 NO=159 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb60.tmp FO
(5E14.6)
LA
 C1       C2       C3       C4       C5       C6       C7       C8
 C9       C10      C11      C12
SE
4 5 6 7 8 9 10 11 12 1 2 3/
MO NY=9 NX=3 BE=SD PS=DI  FI
FIX BE(5,1) BE(6,1) BE(4,2) BE(6,2) BE(4,3) BE(5,3)
FIX BE(7,1) BE(8,1) BE(9,1) BE(7,2) BE(8,2) BE(9,2)
FIX BE(7,3) BE(8,3) BE(9,3) BE(8,4) BE(9,4)
FIX BE(7,5) BE(9,5) BE(7,6) BE(8,6)
FIX GA(1,3) GA(2,3) GA(3,3) GA(7,3) GA(8,3) GA(9,3)
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 12

NUMBER OF Y - VARIABLES 9

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 9

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 159

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C4	C5	C6	C7	C8	C9
C4	1.000					
C5	.584	1.000				
C6	.350	.153	1.000			
C7	.954	.570	.371	1.000		
C8	.552	.825	.192	.571	1.000	
C9	.352	.174	.944	.400	.253	1.000
C10	.920	.545	.342	.977	.561	.376
C11	.472	.619	.246	.518	.814	.310
C12	.318	.124	.909	.378	.221	.970
C1	.139	-.013	-.180	.092	-.053	-.189
C2	-.203	-.098	-.148	-.236	-.147	-.177
C3	.002	.038	-.020	-.122	-.154	-.150

COVARIANCE MATRIX TO BE ANALYZED

	C10	C11	C12	C1	C2	C3
C10	1.000					
C11	.506	1.000				
C12	.369	.291	1.000			
C1	.070	-.072	-.227	1.000		
C2	-.282	-.228	-.205	.006	1.000	
C3	-.172	-.325	-.217	-.006	.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C4	C5	C6	C7	C8	C9
C4	0	0	0	0	0	0
C5	1	0	0	0	0	0
C6	2	3	0	0	0	0
C7	4	0	0	0	0	0
C8	0	5	0	6	0	0
C9	0	0	7	8	9	0
C10	0	0	0	10	0	0
C11	0	0	0	0	11	0
C12	0	0	0	0	0	13

BETA

	C10	C11	C12
C4	0	0	0
C5	0	0	0
C6	0	0	0
C7	0	0	0
C8	0	0	0
C9	0	0	0
C10	0	0	0
C11	12	0	0
C12	14	15	0

GAMMA

	C1	C2	C3
C4	16	17	0
C5	18	19	0
C6	20	21	0
C7	22	23	24
C8	25	26	27
C9	28	29	30
C10	31	32	0
C11	33	34	0
C12	35	36	0

PSI

C4	C5	C6	C7	C8	C9
37	38	39	40	41	42

PSI

C10	C11	C12
43	44	45

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.603	.000	.000	.000	.000	.000
C6	.434	-.111	.000	.000	.000	.000
C7	.952	.000	.000	.000	.000	.000
C8	.000	.765	.000	.108	.000	.000
C9	.000	.000	.919	.015	.043	.000
C10	.000	.000	.000	1.418	.000	.000
C11	.000	.000	.000	.000	.770	.000
C12	.000	.000	.000	.000	.000	.956

BETA

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.049	.000	.000
C12	.016	-.025	.000

GAMMA

	C1	C2	C3
C4	.140	-.204	.000
C5	-.097	.024	.000
C6	-.241	-.070	.000
C7	-.041	-.042	-.124
C8	-.054	-.045	-.170
C9	-.024	-.030	-.123
C10	-.061	.053	.000
C11	-.034	-.101	.000
C12	-.048	-.037	.000

COVARIANCE MATRIX OF Y AND X

C4	C5	C6	C7	C8	C9

C4	1.000					
C5	.584	1.000				
C6	.350	.153	1.000			
C7	.955	.561	.347	1.001		
C8	.552	.831	.171	.564	1.009	
C9	.363	.188	.940	.378	.237	.993
C10	1.334	.790	.495	1.401	.796	.539
C11	.506	.688	.177	.523	.832	.233
C12	.356	.179	.917	.375	.226	.968
C1	.139	-.013	-.180	.092	-.053	-.189
C2	-.203	-.098	-.148	-.236	-.147	-.177
C3	-.002	-.001	.000	-.126	-.184	-.133

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C1	C2	C3
C10	2.200					
C11	.745	1.026				
C12	.538	.221	1.003			
C1	.070	-.072	-.227	1.000		
C2	-.282	-.228	-.205	.006	1.000	
C3	-.178	-.151	-.126	-.006	.007	1.000

PSI

C4	C5	C6	C7	C8	C9
.939	.649	.811	.071	.271	.087

PSI

C10	C11	C12
.232	.324	.055

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C4	C5	C6	C7	C8	C9
.061	.351	.189	.929	.731	.912

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10	C11	C12
.894	.684	.945

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .513

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.603	.000	.000	.000	.000	.000
C6	.434	-.111	.000	.000	.000	.000
C7	.952	.000	.000	.000	.000	.000
C8	.000	.765	.000	.108	.000	.000
C9	.000	.000	.919	.015	.043	.000
C10	.000	.000	.000	.966	.000	.000
C11	.000	.000	.000	.000	.770	.000
C12	.000	.000	.000	.000	.000	.956

BETA

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000

C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.049	.000	.000
C12	.016	-.025	.000

GAMMA

	C1	C2	C3
C4	.140	-.204	.000
C5	-.097	.024	.000
C6	-.241	-.070	.000
C7	-.041	-.042	-.124
C8	-.054	-.045	-.170
C9	-.024	-.030	-.123
C10	-.019	-.054	.000
C11	-.034	-.101	.000
C12	-.048	-.037	.000

COVARIANCE MATRIX OF Y AND X

	C4	C5	C6	C7	C8	C9
C4	1.000					
C5	.584	1.000				
C6	.350	.153	1.000			
C7	.955	.561	.347	1.001		
C8	.552	.831	.171	.564	1.009	
C9	.363	.188	.940	.378	.237	.993
C10	.931	.547	.346	.978	.554	.379
C11	.486	.676	.169	.503	.820	.225
C12	.350	.175	.914	.369	.223	.966
C1	.139	-.013	-.180	.092	-.053	-.189
C2	-.203	-.098	-.148	-.236	-.147	-.177
C3	-.002	-.001	.000	-.126	-.184	-.133

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C1	C2	C3
C10	1.001					
C11	.501	1.005				
C12	.372	.210	.998			
C1	.070	-.072	-.227	1.000		
C2	-.282	-.228	-.205	.006	1.000	
C3	-.122	-.148	-.125	-.006	.007	1.000

PSI

C4	C5	C6	C7	C8	C9
.939	.649	.811	.071	.271	.087

PSI

C10	C11	C12
.042	.324	.055

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C4	C5	C6	C7	C8	C9
.061	.351	.189	.929	.731	.912

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10	C11	C12
.958	.678	.945

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .532

```
CHI-SQUARE WITH  27 DEGREES OF FREEDOM =     81.12 (P = .000)

              GOODNESS OF FIT INDEX = .924
     ADJUSTED GOODNESS OF FIT INDEX = .779
         ROOT MEAN SQUARE RESIDUAL =       .031
```

UNSPECIFIED TITLE

```
SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL =    -.177
  MEDIAN FITTED RESIDUAL =     .000
 LARGEST FITTED RESIDUAL =     .084
```

```
STEMLEAF PLOT
- 1|8
- 1|
- 0|9655
- 0|3221111111100000000000000000000000000000000000000000000
  0|1111112222234
  0|888
```

```
SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL =   -2.490
  MEDIAN STANDARDIZED RESIDUAL =     .000
 LARGEST STANDARDIZED RESIDUAL =    1.631
```

```
STEMLEAF PLOT
- 2|5
- 2|421
- 1|
- 1|2
- 0|99866
- 0|443333221111100000000000000000000000000000000
  0|111222333444
  0|55579
  1|1
  1|566
```

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.067	.000	.000	.000	.000	.000
C6	.092	.090	.000	.000	.000	.000
C7	.022	.000	.000	.000	.000	.000
C8	.000	.051	.000	.053	.000	.000
C9	.000	.000	.026	.031	.029	.000
C10	.000	.000	.000	.017	.000	.000
C11	.000	.000	.000	.000	.055	.000
C12	.000	.000	.000	.000	.000	.021

BETA

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.057	.000	.000

C12	.024	.022	.000

GAMMA

	C1	C2	C3
C4	.078	.078	.000
C5	.065	.066	.000
C6	.074	.074	.000
C7	.022	.022	.021
C8	.042	.043	.042
C9	.025	.025	.024
C10	.016	.017	.000
C11	.046	.048	.000
C12	.020	.020	.000

PSI

C4	C5	C6	C7	C8	C9
.107	.074	.092	.008	.031	.010

PSI .

C10	C11	C12
.005	.037	.006

UNSPECIFIED TITLE

T-VALUES

BETA

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	9.025	.000	.000	.000	.000	.000
C6	4.712	-1.236	.000	.000	.000	.000
C7	43.161	.000	.000	.000	.000	.000
C8	.000	15.027	.000	2.053	.000	.000
C9	.000	.000	35.154	.484	1.483	.000
C10	.000	.000	.000	57.045	.000	.000
C11	.000	.000	.000	.000	14.021	.000
C12	.000	.000	.000	.000	.000	45.282

BETA

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.856	.000	.000
C12	.662	-1.152	.000

GAMMA

	C1	C2	C3
C4	1.801	-2.614	.000
C5	-1.477	.369	.000
C6	-3.272	-.941	.000
C7	-1.885	-1.909	-5.808
C8	-1.276	-1.035	-4.009
C9	-.980	-1.210	-5.094
C10	-1.123	-3.187	.000
C11	-.747	-2.128	.000
C12	-2.471	-1.858	.000

PSI

C4	C5	C6	C7	C8	C9
8.803	8.803	8.803	8.803	8.803	8.803

PSI

C10	C11	C12
8.803	8.803	8.803

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C4	.140	-.204	.000
C5	-.012	-.098	.000
C6	-.179	-.147	.000
C7	.093	-.235	-.124
C8	-.053	-.145	-.183
C9	-.189	-.175	-.133
C10	.071	-.281	-.120
C11	-.072	-.227	-.147
C12	-.226	-.203	-.125

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C4	.078	.078	.000
C5	.080	.080	.000
C6	.078	.078	.000
C7	.077	.077	.021
C8	.078	.078	.042
C9	.077	.077	.024
C10	.076	.076	.021
C11	.077	.077	.033
C12	.076	.076	.023

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C4	.000	.000	.000
C5	.084	-.123	.000
C6	.062	-.078	.000
C7	.133	-.194	.000
C8	.001	-.101	-.013
C9	-.165	-.145	-.010
C10	.090	-.227	-.120
C11	-.037	-.125	-.147
C12	-.178	-.166	-.125

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C4	.000	.000	.000
C5	.048	.049	.000
C6	.032	.033	.000
C7	.074	.074	.000
C8	.066	.067	.007
C9	.073	.073	.005
C10	.075	.075	.021

C11	.063	.064	.033
C12	.074	.074	.023

TOTAL EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.603	.000	.000	.000	.000	.000
C6	.368	-.111	.000	.000	.000	.000
C7	.952	.000	.000	.000	.000	.000
C8	.564	.765	.000	.108	.000	.000
C9	.376	-.069	.919	.020	.043	.000
C10	.920	.000	.000	.966	.000	.000
C11	.479	.589	.000	.130	.770	.000
C12	.362	-.081	.879	.031	.022	.956

TOTAL EFFECTS OF Y ON Y

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.049	.000	.000
C12	.014	-.025	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS 1.460

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.067	.000	.000	.000	.000	.000
C6	.075	.090	.000	.000	.000	.000
C7	.022	.000	.000	.000	.000	.000
C8	.066	.051	.000	.053	.000	.000
C9	.073	.085	.026	.030	.029	.000
C10	.027	.000	.000	.017	.000	.000
C11	.067	.057	.000	.066	.055	.000
C12	.072	.083	.032	.036	.033	.021

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.057	.000	.000
C12	.023	.022	.000

INDIRECT EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.000	.000	.000	.000	.000	.000
C6	-.067	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.564	.000	.000	.000	.000	.000
C9	.376	-.069	.000	.005	.000	.000
C10	.920	.000	.000	.000	.000	.000
C11	.479	.589	.000	.130	.000	.000
C12	.362	-.081	.879	.031	.022	.000

INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	-.001	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C4	C5	C6	C7	C8	C9
C4	.000	.000	.000	.000	.000	.000
C5	.000	.000	.000	.000	.000	.000
C6	.055	.000	.000	.000	.000	.000
C7	.000	.000	.000	.000	.000	.000
C8	.066	.000	.000	.000	.000	.000
C9	.073	.085	.000	.004	.000	.000
C10	.027	.000	.000	.000	.000	.000
C11	.067	.057	.000	.066	.000	.000
C12	.072	.083	.032	.036	.033	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12
C4	.000	.000	.000
C5	.000	.000	.000
C6	.000	.000	.000
C7	.000	.000	.000
C8	.000	.000	.000
C9	.000	.000	.000
C10	.000	.000	.000
C11	.000	.000	.000
C12	.002	.000	.000

THE PROBLEM USED 39632 BYTES (= 7.8% OF AVAILABLE WORKSPACE)

TIME USED : 34.1 SECONDS

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=12 no=159
->  /se /10 11 12 1 2 3/
->  /mo ny=3 nx=3 be=sd ps=di  fi
->   /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=12 NO=159 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb63.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11       C12
SE
10 11 12 1 2 3/
MO NY=3 NX=3 BE=SD PS=DI  FI
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 12

NUMBER OF Y - VARIABLES 3

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 3

NUMBER OF KSI - VARIABLES 3

NUMBER OF OBSERVATIONS 159

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C10	C11	C12	C1	C2	C3
C10	1.000					
C11	.506	1.000				
C12	.369	.291	1.000			
C1	.070	-.072	-.227	1.000		
C2	-.282	-.228	-.205	.006	1.000	
C3	-.172	-.325	-.217	-.006	.007	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

BETA

	C10	C11	C12
C10	0	0	0
C11	1	0	0
C12	2	3	0

GAMMA

	C1	C2	C3
C10	4	5	6
C11	7	8	9
C12	10	11	12

PSI

C10	C11	C12
13	14	15

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

BETA

	C10	C11	C12
C10	.000	.000	.000
C11	.442	.000	.000
C12	.309	.044	.000

GAMMA

	C1	C2	C3
C10	.071	-.281	-.170
C11	-.104	-.101	-.249
C12	-.246	-.105	-.150

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C1	C2	C3
C10	1.000					
C11	.506	1.000				
C12	.369	.291	1.000			
C1	.070	-.072	-.227	1.000		
C2	-.282	-.228	-.205	.006	1.000	
C3	-.172	-.325	-.217	-.006	.007	1.000

PSI

C10	C11	C12
.887	.665	.763

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10	C11	C12
.113	.335	.237

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .288

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

BETA

	C10	C11	C12
C10	.000	.000	.000
C11	.442	.000	.000
C12	.309	.044	.000

GAMMA

	C1	C2	C3
C10	.071	-.281	-.170
C11	-.104	-.101	-.249
C12	-.246	-.105	-.150

COVARIANCE MATRIX OF Y AND X

	C10	C11	C12	C1	C2	C3
C10	1.000					
C11	.506	1.000				
C12	.369	.291	1.000			
C1	.070	-.072	-.227	1.000		
C2	-.282	-.228	-.205	.006	1.000	
C3	-.172	-.325	-.217	-.006	.007	1.000

PSI

C10	C11	C12
.887	.665	.763

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

C10	C11	C12
.113	.335	.237

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .288

CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

GOODNESS OF FIT INDEX =1.000
ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

BETA

	C10	C11	C12
C10	.000	.000	.000
C11	.070	.000	.000
C12	.084	.086	.000

GAMMA

	C1	C2	C3
C10	.076	.076	.076
C11	.066	.068	.067
C12	.071	.074	.074

PSI

C10	C11	C12
.101	.075	.087

UNSPECIFIED TITLE

T-VALUES

BETA

	C10	C11	C12
C10	.000	.000	.000
C11	6.361	.000	.000
C12	3.689	.509	.000

GAMMA

C1 C2 C3

C10	.936	-3.714	-2.247
C11	-1.587	-1.485	-3.737
C12	-3.463	-1.428	-2.016

PSI

C10	C11	C12
8.803	8.803	8.803

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C10	.071	-.281	-.170
C11	-.073	-.226	-.324
C12	-.227	-.202	-.217

STANDARD ERRORS FOR TOTAL EFFECTS OF X ON Y

	C1	C2	C3
C10	.076	.076	.076
C11	.074	.074	.074
C12	.074	.074	.074

INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C10	.000	.000	.000
C11	.031	-.124	-.075
C12	.019	-.097	-.067

STANDARD ERRORS FOR INDIRECT EFFECTS OF X ON Y

	C1	C2	C3
C10	.000	.000	.000
C11	.034	.039	.035
C12	.027	.034	.035

TOTAL EFFECTS OF Y ON Y

	C10	C11	C12
C10	.000	.000	.000
C11	.442	.000	.000
C12	.328	.044	.000

LARGEST EIGENVALUE OF B*B' (STABILITY INDEX) IS .292

STANDARD ERRORS FOR TOTAL EFFECTS OF Y ON Y

	C10	C11	C12
C10	.000	.000	.000
C11	.070	.000	.000
C12	.075	.086	.000

INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12
C10	.000	.000	.000
C11	.000	.000	.000
C12	.019	.000	.000

STANDARD ERRORS FOR INDIRECT EFFECTS OF Y ON Y

	C10	C11	C12
C10	.000	.000	.000
C11	.000	.000	.000
C12	.038	.000	.000

THE PROBLEM USED 6152 BYTES (= 1.2% OF AVAILABLE WORKSPACE)

TIME USED : 1.3 SECONDS

Explanation for path coefficient value differences in main study 2

Figure A

Relationship between IM2 and Feedback

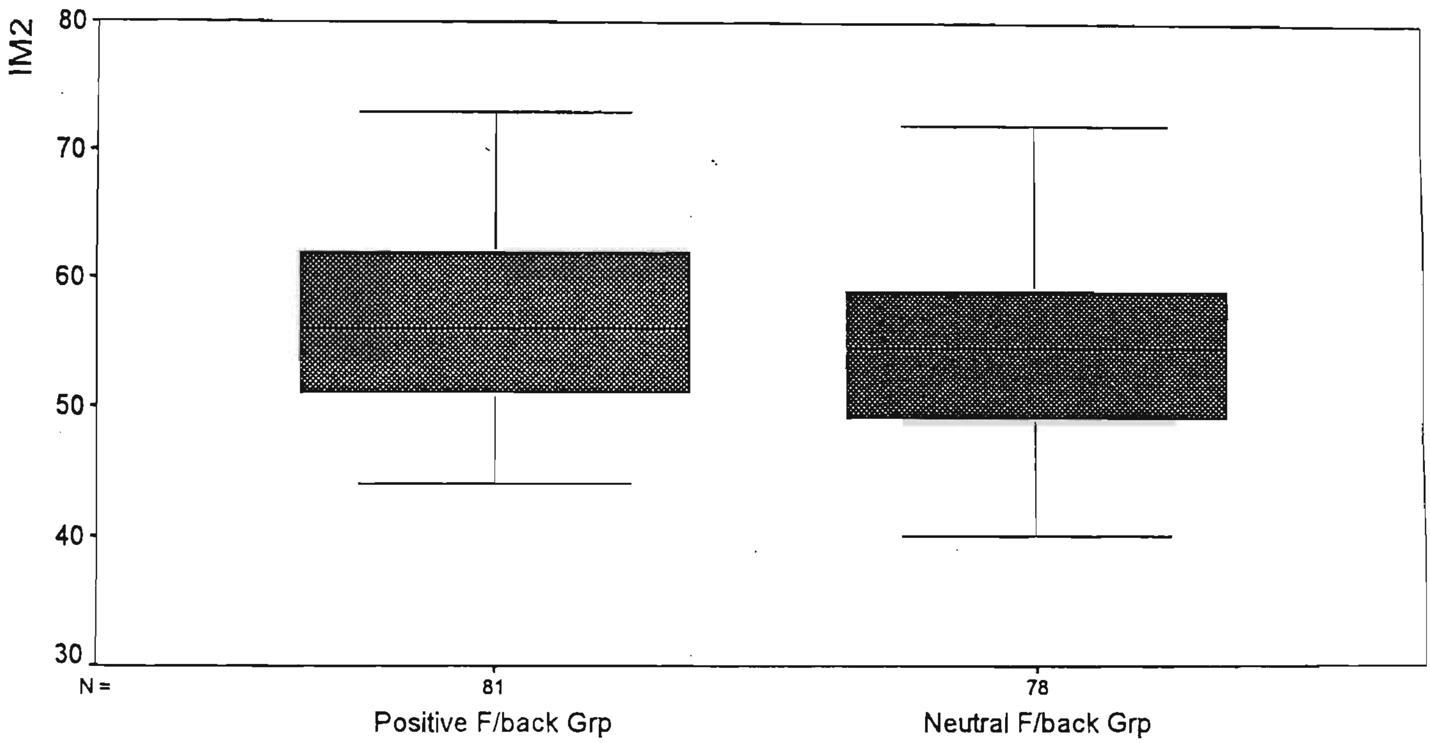


Figure B

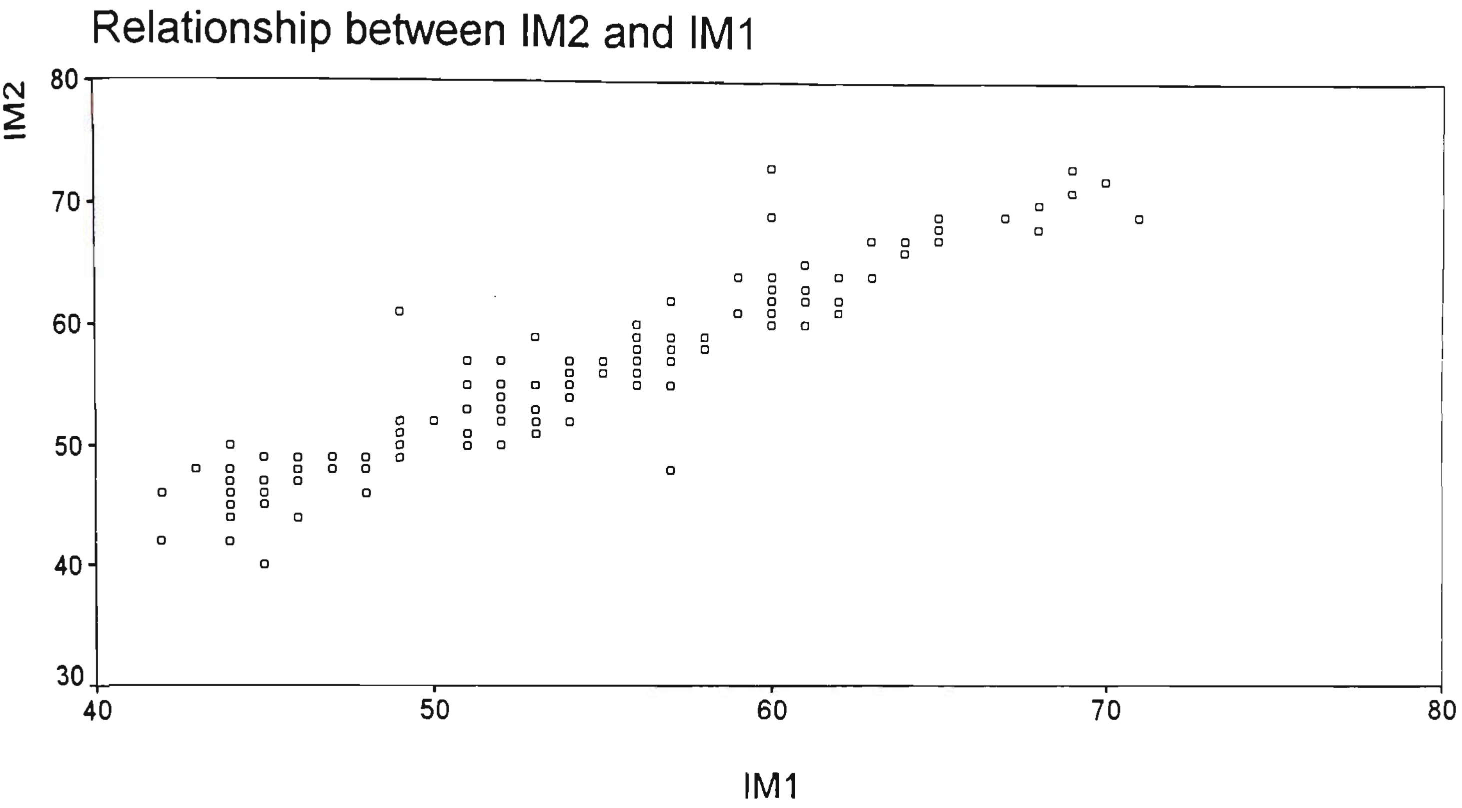

Relationship between IM2 and IM1
IM2
80
70
60
50
40
30
40
50
60
70
80
IM1

Figure C

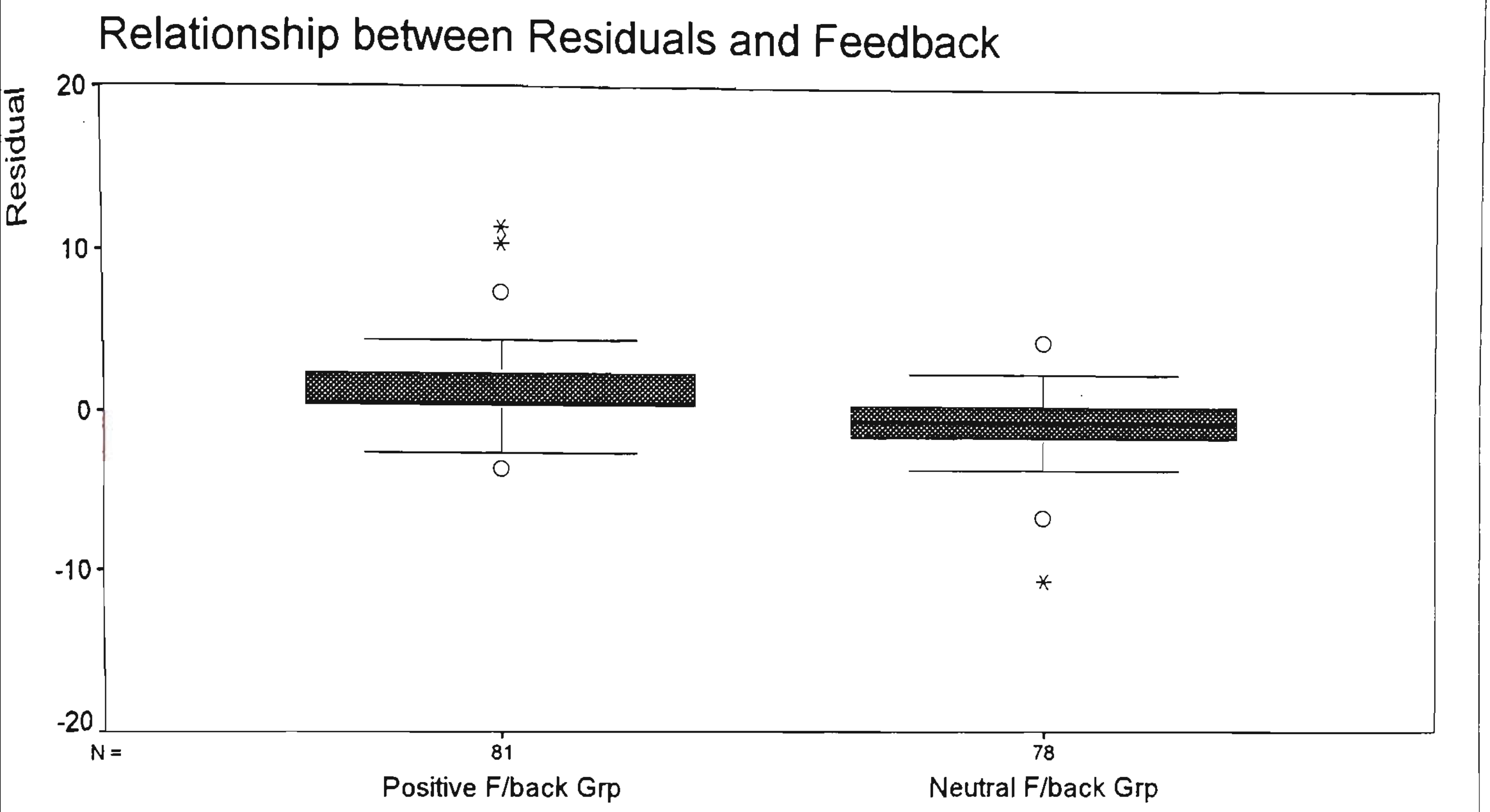
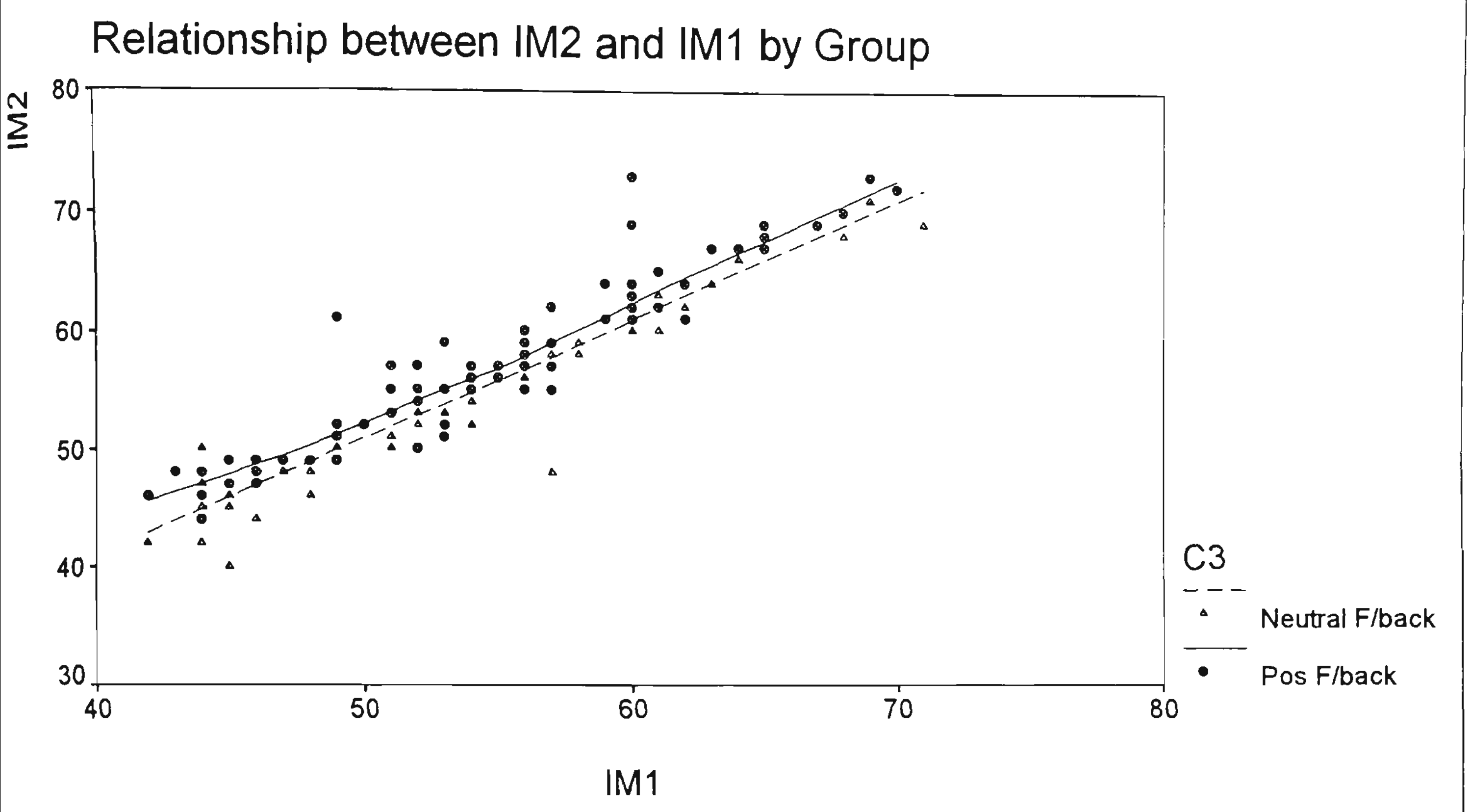

Relationship between Residuals and Feedback
Residual
20
10
0
-10
-20
N =
81
78
Positive F/back Grp
Neutral F/back Grp

Figure D



Relationship between IM2 and IM1 by Group
IM2
80
70
60
50
40
30
40
50
60
70
80
IM1
C3
Neutral F/back
Pos F/back

Figure E

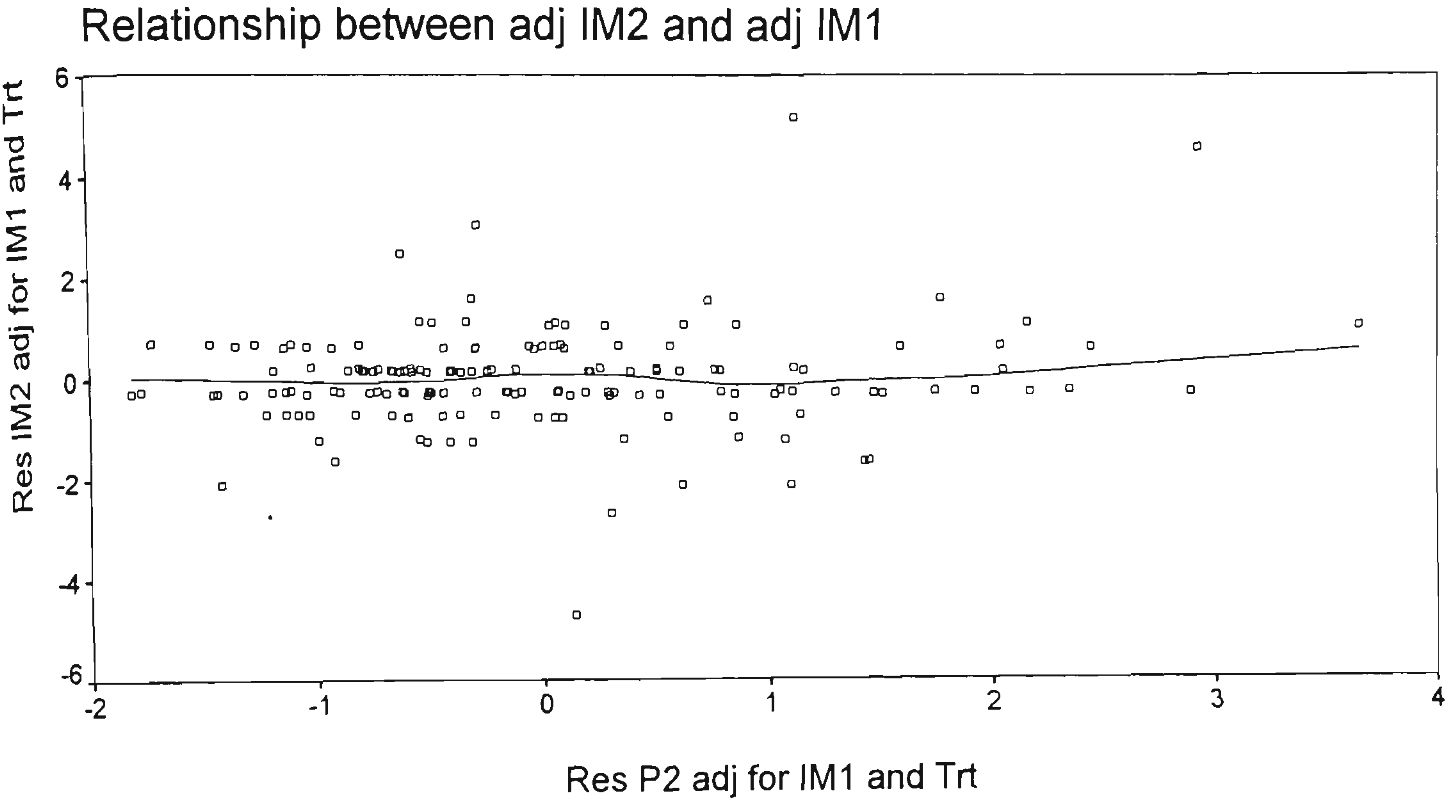
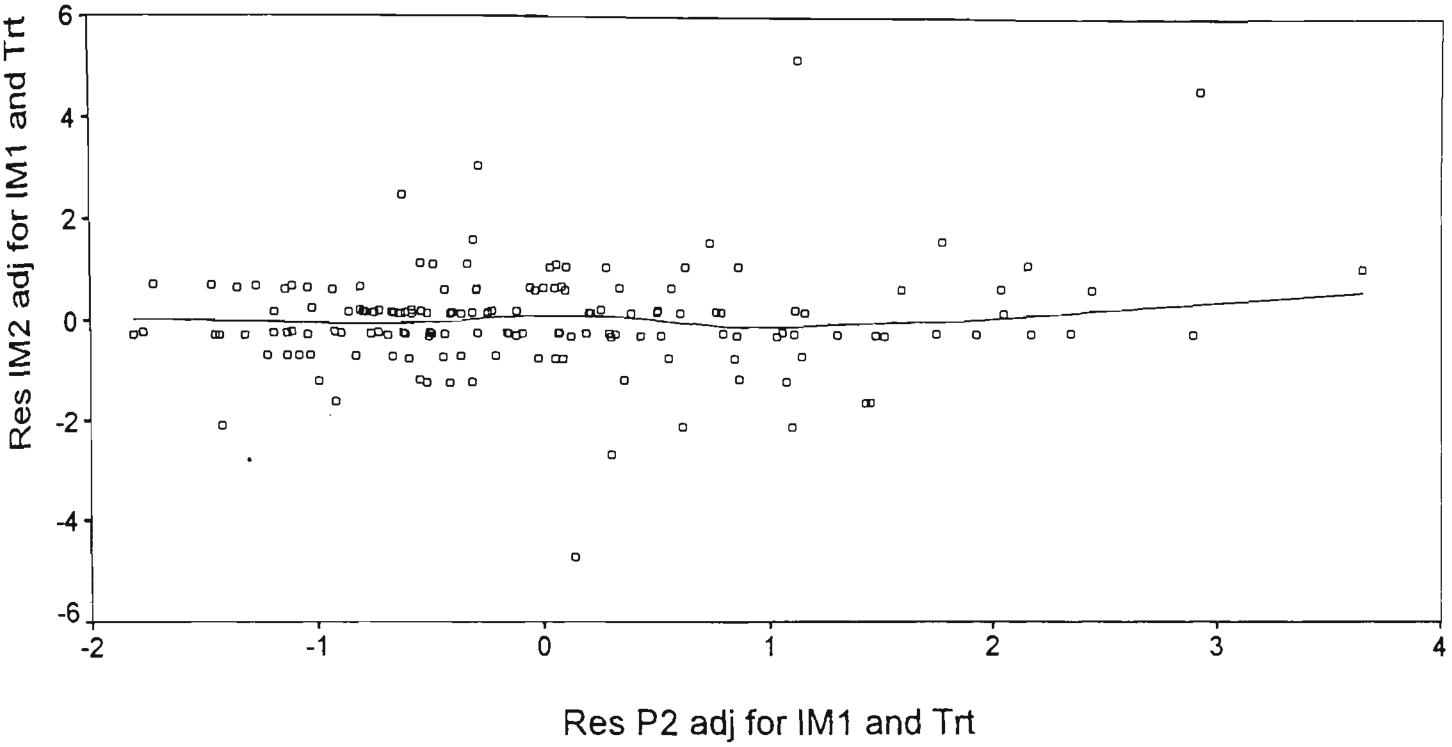

Relationship between adj IM2 and adj IM1
Res IM2 adj for IM1 and Trt
6
4
2
0
-2
-4
-6
-2
-1
0
1
2
3
4
Res P2 adj for IM1 and Trt

Figure E

Relationship between adj IM2 and adj IM1



Appendix 10.1

McAuley, Duncan and Tammen (1989) supported the use of the IMI by using a confirmatory factor analysis. In fact, their results (as noted by Markland 1993) gave significant χ^2 values, which generally indicate that the fit is not good, although it is well known that these values are only one way of looking at the fit of the model and should be used in a relative, rather than an absolute, way. A table similar to that presented by McAuley et al (1989) is shown for the current analysis in Table 10.1.

M_4 3 first order latent variables, 1 2nd order
M_3 3 first order latent variables, no 2nd order
M_1 1 first order latent variable
M_0 Null Model

McAuley et al (1989) compared the second order model to the first order model. However Table 10.1 shows that all the statistics for the two models are the same in the present study. This is because removal of the Pressure /Tension subscale leaves only three subscales and the mathematics below demonstrates that when there are only three first order latent variables the two models generate the same covariance matrix and hence cannot be separated on the basis of the data.

The second order model can be written as (in standard LISREL notation)

$$y = \Lambda_y(\Gamma\xi + \varsigma_2) + \varepsilon$$

with variance covariance matrix

$$\sum\nolimits_2 = \Lambda_y(\Gamma\Phi\Gamma' + \Psi_2)\Lambda_y' + \theta_\varepsilon$$

The first order model can be written as

$$y = \Lambda_y(\varsigma_1) + \varepsilon$$

with variance matrix

$$\sum\nolimits_1 = \Lambda_y(\Psi_1)\Lambda_y' + \theta_\varepsilon$$

If $\Psi_1 = \Gamma\Phi\Gamma' + \Psi_2$ then $\sum_1 = \sum_2$ and hence the two models are equivalent. Note that Ψ_1 and Ψ_2 can be written as

$$\begin{bmatrix} \sigma_1^2 & \rho_{12}\sigma_1\sigma_2 & \rho_{13}\sigma_1\sigma_3 \\ . & \sigma_2^2 & \rho_{23}\sigma_2\sigma_3 \\ . & . & \sigma_3^2 \end{bmatrix} \text{ and } \begin{bmatrix} \sigma_4^2 & 0 & 0 \\ & \sigma_5^2 & 0 \\ & & \sigma_6^2 \end{bmatrix}.$$

With $\Gamma' = \begin{bmatrix} 1 & \gamma_1 & \gamma_2 \end{bmatrix}$ and $\Phi = \begin{bmatrix} \sigma_4^2 \end{bmatrix}$

$$\Gamma\Phi\Gamma' + \Psi_2 = \begin{bmatrix} \sigma_4^2 + \sigma_5^2 & \gamma_1\sigma_4^2 & \gamma_2\sigma_4^2 \\ . & \sigma_4^2\gamma_1^2 + \sigma_6^2 & \gamma_1\gamma_2\sigma_4^2 \\ . & . & \sigma_4^2\gamma_1^2 + \sigma_7^2 \end{bmatrix}$$

Therefore generating the equations:

$$\begin{aligned} \sigma_1^2 &= \sigma_4^2 + \sigma_5^2 \\ \sigma_2^2 &= \sigma_4^2\gamma_1^2 + \sigma_6^2 \\ \sigma_3^2 &= \sigma_4^2\gamma_2^2 + \sigma_7^2 \\ \rho_{12}\sigma_1\sigma_2 &= \gamma_1\sigma_4^2 \\ \rho_{13}\sigma_1\sigma_3 &= \gamma_2\sigma_4^2 \\ \rho_{23}\sigma_1\sigma_3 &= \gamma_1\gamma_2\sigma_4^2 \end{aligned}$$

If $\sigma_4, \sigma_5, \sigma_6, \sigma_7, \gamma_1, \gamma_2$ can be expressed in terms of $\sigma_1, \sigma_2, \sigma_3, \rho_{12}, \rho_{13}, \rho_{23}$ the result is proved. in fact, manipulating the above equations, the forming is obtained:

$$\begin{aligned} \sigma_5^2 &= \sigma_1^2\left(\frac{\rho_{23} - \rho_{12}\rho_{13}}{\rho_{23}}\right) & \sigma_4^2 &= \frac{\rho_{12}\rho_{13}}{\rho_{23}}\sigma_1^2 \\ \sigma_6^2 &= \sigma_2^2\left(\frac{\rho_{13} - \rho_{12}\rho_{23}}{\rho_{13}}\right) & \gamma_1 &= \frac{\rho_{23}\sigma_2}{\rho_{13}\sigma_1} \\ \sigma_7^2 &= \sigma_3^2\left(\frac{\rho_{12} - \rho_{13}\rho_{23}}{\rho_{12}}\right) & \gamma_1 &= \frac{\rho_{23}\sigma_3}{\rho_{12}\sigma_1} \end{aligned}$$

Hence the two models are equivalent. With only three subscales it would be impossible to separate the first order and second order models on the basis of the data.

Table 10.2 shows the estimates of the parameters for both the first and second order models. For the first-order model λ ij gave the loadings of the items on their respective subscales. Since the scale of latent variable was arbitrary, one of the it was set to 1 for each subscale. All the loadings were statistically significant since all items' values of t were greater than 2. For the second-order model, in addition, the LISREL package provided estimates of the loadings λ ij of the first order factors on intrinsic motivation. As before, the scale for intrinsic motivation was arbitrary and hence one of the item loading was λ set to 1. All the loadings were statistically significant indicating that the first order factor, loaded on the intrinsic motivation factor.

Table 10.2. Parameter for First and Second Order Models (N=80).

		First Order Model Loading	t-value	Second Order Model Loading	t-value
Factor 1					
	λ_1	1		1	
	λ_3	0.617	2.90	0.617	2.90
	λ_6	0.691	3.20	0.691	3.20
	λ_8	0.798	3.59	0.798	3.59
Factor 2					
	λ_2	1		1	
	λ_4	1.04	11.43	1.04	11.43
	λ_9	0.985	10.48	0.985	10.48
	λ_{11}	0.798	7.32	0.798	7.32
Factor 3					
	λ_5	1		1	
	λ_7	1.055	6.51	1.055	6.51
	λ_{10}	0.959	6.23	0.959	6.23
IM					
	δ_{11}			1	
	δ_{21}			1.161	3.48
	δ_{31}			0.674	3.21

```
-> prelis
->    /variables c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 (co)
->    /matrix=out ('cfa matrix').
```

PRELIS 1.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING PRELIS CONTROL LINES HAVE BEEN READ :

```
SPSS for MS WINDOWS Release 6.0;
DA NI=11 NO=0 MI= -0.989898D+37 MC=1 TR=LI
LA
  C1         C2         C3         C4         C5         C6         C7         C8         C9
RA FI=c:\windows\temp\spssb37.tmp
CO C1
CO C2
CO C3
CO C4
CO C5
CO C6
CO C7
CO C8
CO C9
CO C10
CO C11
OU MA=KM SM=c:\windows\temp\spssb38.tmp
```

TOTAL SAMPLE SIZE = 80

UNIVARIATE SUMMARY STATISTICS FOR CONTINUOUS VARIABLES

VARIABLE	MEAN	ST. DEV.	SKEWNESS	KURTOSIS	MINIMUM	FREQ.	MAXIMUM	FREQ.
C1	5.613	.665	.103	-.232	4.000	2	7.000	6
C2	4.663	1.232	.510	-.937	3.000	11	7.000	7
C3	5.425	.823	-.242	-.565	4.000	12	7.000	5
C4	4.913	1.203	-.230	.256	2.000	4	7.000	9
C5	5.000	.914	.612	-.399	4.000	27	7.000	6
C6	5.313	1.038	-.595	-.031	2.000	1	7.000	6
C7	5.000	.871	.000	.010	3.000	3	7.000	3
C8	5.350	.618	.597	.366	4.000	3	7.000	3
C9	4.875	1.195	-.256	-.348	2.000	2	7.000	6
C10	5.375	.862	.156	-.543	4.000	12	7.000	8
C11	5.063	1.011	.099	-.363	3.000	4	7.000	7

SPSS for MS WINDOWS Release 6.0;

ESTIMATED CORRELATION MATRIX

C1	C2	C3	C4	C5	C6

```
-> GET TRANSLATE
->   FILE='C:\WINWORD\STATCONS\CHOI\CFA.DAT'
->   /TYPE=TAB /MAP .

Data written to the working file.
1 variables and 80 cases written.
Variable: VAR1        Type: String   Format: A40
-> EXECUTE .
-> data list file='c:\winword\statcons\choi\cfa.dat' free records=1/
-> c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11.
-> prelis
->  /varibales c1 c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 (co)
->  /type=corr
->  /matrix=out ('path matrix').
```

P R E L I S 1.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING PRELIS CONTROL LINES HAVE BEEN READ :

```
SPSS for MS WINDOWS Release 6.0;
DA NI=11 NO=0 MI= -0.989898D+37 MC=1 TR=LI
LA
   C1       C2       C3       C4       C5       C6       C7       C8       C9
RA FI=c:\windows\temp\spssb4.tmp
CO C1
CO C2
CO C3
CO C4
CO C5
CO C6
CO C7
CO C8
CO C9
CO C10
CO C11
OU MA=KM SM=c:\windows\temp\spssb5.tmp
```

TOTAL SAMPLE SIZE =   80

UNIVARIATE SUMMARY STATISTICS FOR CONTINUOUS VARIABLES

VARIABLE	MEAN	ST. DEV.	SKEWNESS	KURTOSIS	MINIMUM	FREQ.	MAXIMUM	FREQ.
C1	5.613	.665	.103	-.232	4.000	2	7.000	6
C2	4.663	1.232	.510	-.937	3.000	11	7.000	7
C3	5.425	.823	-.242	-.565	4.000	12	7.000	5
C4	4.913	1.203	-.230	.256	2.000	4	7.000	9
C5	5.000	.914	.612	-.399	4.000	27	7.000	6
C6	5.313	1.038	-.595	-.031	2.000	1	7.000	6
C7	5.000	.871	.000	.010	3.000	3	7.000	3
C8	5.350	.618	.597	.366	4.000	3	7.000	3
C9	4.875	1.195	-.256	-.348	2.000	2	7.000	6

```
     ....      ....     .156    -.543    4.000    12    7.000    8
C11  5.063    1.011     .099    -.363    3.000     4    7.000    7
```

```
SPSS for MS WINDOWS Release 6.0;

       ESTIMATED CORRELATION MATRIX

              C1        C2        C3        C4        C5        C6
         --------  --------  --------  --------  --------  --------
  C1        1.000
  C2         .564     1.000
  C3         .489      .355     1.000
  C4         .416      .817      .076     1.000
  C5         .333      .540      .505      .276     1.000
  C6         .141      .351      .006      .326      .200     1.000
  C7         .262      .483      .159      .278      .620      .350
  C8         .241      .373      .152      .399      .202      .439
  C9         .400      .728      .145      .794      .359      .430
  C10        .256      .383      .290      .239      .578      .108
  C11        .526      .526      .226      .671      .164      .090

       ESTIMATED CORRELATION MATRIX

              C7        C8        C9       C10       C11
         --------  --------  --------  --------  --------
  C7        1.000
  C8         .070     1.000
  C9         .389      .488     1.000
  C10        .640     -.107      .169     1.000
  C11        .000      .349      .667     -.114     1.000

      THE PROBLEM USED     48016 BYTES (=  9.3% OF AVAILABLE WORKSPACE)


 -> lisrel
 ->  /matrix=in ('path matrix')
 ->  /da ni=11 no=80
 ->  /se /1 3 6 8/
 ->  /mo nx=4 nk=1 lx=fr ph=st
 ->  /ou se tv ef.


                              L I S R E L  7.20

                                     BY

                        KARL G JORESKOG AND DAG SORBOM


                   This program is published exclusively by

                          SCIENTIFIC SOFTWARE, Inc.
                       1525 East 53rd Street, Suite 906
                        Chicago, Illinois 60615, U.S.A.
                        (800)247-6113 or (312)684-4979

    Copyright by Scientific Software, Inc. (a Michigan corporation), 1981-91.
             Partial copyright by Microsoft Corporation, 1984-90.
                            All rights reserved.

 THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :


 DA NI=11 NO=80 XM=-0.989898D+09
 KM FI=c:\windows\temp\spssb8.tmp FO
 (5E14.6)
 LA
  C1       C2       C3       C4       C5       C6       C7       C8
  C9       C10      C11
 SE
 1 3 6 8/
 MO NX=4 NK=1 LX=FR PH=ST
 OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 11

NUMBER OF Y - VARIABLES 0

NUMBER OF X - VARIABLES 4

NUMBER OF ETA - VARIABLES 0

NUMBER OF KSI - VARIABLES 1

NUMBER OF OBSERVATIONS 80

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C1	C3	C6	C8
C1	1.000			
C3	.489	1.000		
C6	.141	.006	1.000	
C8	.241	.152	.439	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

LAMBDA X

	KSI 1
C1	1
C3	2
C6	3
C8	4

PHI

	KSI 1
KSI 1	0

THETA DELTA

C1	C3	C6	C8
5	6	7	8

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

LAMBDA X

	KSI 1
C1	.826
C3	.469
C6	.239
C8	.430

PHI

	KSI 1
KSI 1	1.000

THETA DELTA

C1	C3	C6	C8

.318	.780	.943	.815

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C1	C3	C6	C8
.682	.220	.057	.185

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .731

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

LAMBDA X

	KSI 1
C1	.831
C3	.575
C6	.189
C8	.313

PHI

	KSI 1
KSI 1	1.000

THETA DELTA

C1	C3	C6	C8
.309	.669	.964	.902

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C1	C3	C6	C8
.691	.331	.036	.098

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .742

CHI-SQUARE WITH 2 DEGREES OF FREEDOM = 15.80 (P = .000)

GOODNESS OF FIT INDEX = .915
ADJUSTED GOODNESS OF FIT INDEX = .574
ROOT MEAN SQUARE RESIDUAL = .125

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -.103
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .380

```
STEMLEAF PLOT
- 1|0
- 0|3220000
  0|1
  1|
  2|
  3|8
```

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -1.431
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = 3.767

```
STEMLEAF PLOT
- 0|44770000
  0|
  2|88


LARGEST POSITIVE STANDARDIZED RESIDUALS

RESIDUAL FOR        C3 AND        C1 =    3.767

RESIDUAL FOR        C8 AND        C6 =    3.767


UNSPECIFIED TITLE


STANDARD ERRORS

        LAMBDA X

              KSI 1
           ________
     C1        .215
     C3        .170
     C6        .132
     C8        .136

        THETA DELTA

                 C1           C3           C6           C8
           ________     ________     ________     ________
               .328         .189         .156         .152


UNSPECIFIED TITLE


T-VALUES

        LAMBDA X

              KSI 1
           ________
     C1       3.864
     C3       3.383
     C6       1.428
     C8       2.307

        THETA DELTA

                 C1           C3           C6           C8
           ________     ________     ________     ________
               .944        3.546        6.191        5.936

         THE PROBLEM USED     2264 BYTES (=    .4% OF AVAILABLE WORKSPACE)

                              TIME USED :     3.2 SECONDS


-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=11 no=80
->  /se /2 4 9 11/
->  /mo nx=4 nk=1 lx=fr ph=st
->  /ou se tv ef.


                                         L I S R E L  7.20

                                                BY

                              KARL G JORESKOG AND DAG SORBOM
```

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=11 NO=80 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb11.tmp FO
(5E14.6)
LA
 C1       C2       C3       C4       C5       C6       C7       C8
 C9       C10      C11
SE
2 4 9 11/
MO NX=4 NK=1 LX=FR PH=ST
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 11

NUMBER OF Y - VARIABLES 0

NUMBER OF X - VARIABLES 4

NUMBER OF ETA - VARIABLES 0

NUMBER OF KSI - VARIABLES 1

NUMBER OF OBSERVATIONS 80

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C2	C4	C9	C11
C2	1.000			
C4	.817	1.000		
C9	.728	.794	1.000	
C11	.526	.671	.667	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

LAMBDA X

	KSI 1
C2	1
C4	2
C9	3
C11	4

PHI

	KSI 1
KSI 1	0

THETA DELTA

	C9	C11
5	6	7	8

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

LAMBDA X

	KSI 1
C2	.858
C4	.947
C9	.826
C11	.723

PHI

	KSI 1
KSI 1	1.000

THETA DELTA

C2	C4	C9	C11
.264	.104	.318	.477

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C2	C4	C9	C11
.736	.896	.682	.523

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .936

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

LAMBDA X

	KSI 1
C2	.852
C4	.947
C9	.850
C11	.705

PHI

	KSI 1
KSI 1	1.000

THETA DELTA

C2	C4	C9	C11
.275	.103	.277	.503

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C2	C4	C9	C11
.725	.897	.723	.497

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .937

CHI-SQUARE WITH 2 DEGREES OF FREEDOM = 6.92 (P = .031)

GOODNESS OF FIT INDEX = .961

```
                          F FIT INDEX = .803
              ROOT MEAN SQUARE RESIDUAL =      .032


UNSPECIFIED TITLE


SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL =    -.075
  MEDIAN FITTED RESIDUAL =     .000
 LARGEST FITTED RESIDUAL =     .067


STEMLEAF PLOT
- 0|8
- 0|1000000
  0|1
  0|7


SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL =   -2.229
  MEDIAN STANDARDIZED RESIDUAL =     .000
 LARGEST STANDARDIZED RESIDUAL =    1.987


STEMLEAF PLOT
- 2|22
- 1|
- 0|0000
  0|22
  1|
  2|00


UNSPECIFIED TITLE


STANDARD ERRORS

       LAMBDA X

             KSI 1
          --------
    C2        .092
    C4        .086
    C9        .092
   C11        .100

       THETA DELTA

                C2          C4          C9         C11
          --------    --------    --------    --------
              .056        .043        .056        .086


UNSPECIFIED TITLE


T-VALUES

       LAMBDA X

             KSI 1
          --------
    C2       9.248
    C4      10.987
    C9       9.225
   C11       7.045

       THETA DELTA

                C2          C4          C9         C11
          --------    --------    --------    --------
             4.931       2.382       4.950       5.838
```

```
        THE PROBLEM USED      2264 BYTES (=    .4% OF AVAILABLE WORKSPACE)

                           TIME USED :        .6 SECONDS


-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=11 no=80
->  /se /5 7 10/
->  /mo nx=3 nk=1 lx=fr ph=st
->  /ou se tv ef.
```

```
                                 L I S R E L  7.20

                                        BY

                           KARL G JORESKOG AND DAG SORBOM

                    This program is published exclusively by

                              SCIENTIFIC SOFTWARE, Inc.
                           1525 East 53rd Street, Suite 906
                            Chicago, Illinois 60615, U.S.A.
                            (800)247-6113 or (312)684-4979
```



```
THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :


DA NI=11 NO=80 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb14.tmp FO
(5E14.6)
LA
 C1        C2        C3        C4        C5        C6        C7        C8
 C9        C10       C11
SE
5 7 10/
MO NX=3 NK=1 LX=FR PH=ST
OU SE TV EF


UNSPECIFIED TITLE

                           NUMBER OF INPUT VARIABLES 11

                           NUMBER OF Y - VARIABLES    0

                           NUMBER OF X - VARIABLES    3

                           NUMBER OF ETA - VARIABLES  0

                           NUMBER OF KSI - VARIABLES  1

                           NUMBER OF OBSERVATIONS    80


UNSPECIFIED TITLE

        COVARIANCE MATRIX TO BE ANALYZED

                C5         C7         C10
            --------   --------   --------
     C5       1.000
     C7        .620      1.000
     C10       .578       .640      1.000
```

```
UN

PARAMETER SPECIFICATIONS

        LAMBDA X

              KSI 1
           --------
     C5           1
     C7           2
    C10           3

        PHI

              KSI 1
           --------
  KSI 1           0

        THETA DELTA

                 C5          C7          C10
           --------    --------    --------
                  4           5           6


UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

        LAMBDA X

              KSI 1
           --------
     C5        .748
     C7        .828
    C10        .773

        PHI

              KSI 1
           --------
  KSI 1       1.000

        THETA DELTA

                 C5          C7          C10
           --------    --------    --------
               .440        .314        .403

        SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

                 C5          C7          C10
           --------    --------    --------
               .560        .686        .597

        TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS    .832


UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

        LAMBDA X

              KSI 1
           --------
     C5        .748
     C7        .828
    C10        .773

        PHI

              KSI 1
           --------
  KSI 1       1.000

        THETA DELTA
```

C5	C7	C10
.440	.314	.403

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C5	C7	C10
.560	.686	.597

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .832

CHI-SQUARE WITH 0 DEGREES OF FREEDOM = .00 (P = 1.00)

GOODNESS OF FIT INDEX =1.000
ROOT MEAN SQUARE RESIDUAL = .000

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = .000
MEDIAN FITTED RESIDUAL = .000
LARGEST FITTED RESIDUAL = .000

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = .000
MEDIAN STANDARDIZED RESIDUAL = .000
LARGEST STANDARDIZED RESIDUAL = .000

UNSPECIFIED TITLE

STANDARD ERRORS

LAMBDA X

	KSI 1
C5	.106
C7	.104
C10	.106

THETA DELTA

C5	C7	C10
.098	.098	.098

UNSPECIFIED TITLE

T-VALUES

LAMBDA X

	KSI 1
C5	7.057
C7	7.927
C10	7.319

THETA DELTA

C5	C7	C10
4.478	3.197	4.129

84 BYTES (= .3% OF AVAILABLE WORKSPACE)

TIME USED : .4 SECONDS

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=11 no=80
->  /se /5 7 10/
->  /mo nx=3 nk=1 lx=fr ph=st
->  /eq lx(1,1) lx(1,2) lx(1,3)
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979

THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :

```
DA NI=11 NO=80 XM=-0.989898D+09
KM FI=c:\windows\temp\spssbl7.tmp FO
(5E14.6)
LA
 C1       C2       C3       C4       C5       C6       C7       C8
 C9       C10      C11
SE
5 7 10/
MO NX=3 NK=1 LX=FR PH=ST
EQ LX(1,1) LX(1,2) LX(1,3)
OU SE TV EF
```

UNSPECIFIED TITLE

NUMBER OF INPUT VARIABLES 11

NUMBER OF Y - VARIABLES 0

NUMBER OF X - VARIABLES 3

NUMBER OF ETA - VARIABLES 0

NUMBER OF KSI - VARIABLES 1

NUMBER OF OBSERVATIONS 80

UNSPECIFIED TITLE

COVARIANCE MATRIX TO BE ANALYZED

	C5	C7	C10
C5	1.000		
C7	.620	1.000	
C10	.578	.640	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

LAMBDA X

	KSI 1
C5	1
C7	1
C10	1

PHI

	KSI 1
KSI 1	0

THETA DELTA

C5	C7	C10
2	3	4

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

LAMBDA X

	KSI 1
C5	.783
C7	.783
C10	.783

PHI

	KSI 1
KSI 1	1.000

THETA DELTA

C5	C7	C10
.440	.314	.403

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C5	C7	C10
.582	.661	.603

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .830

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

LAMBDA X

	KSI 1
C5	.785
C7	.785
C10	.785

PHI

	KSI 1
KSI 1	1.000

C5	C7	C10
.421	.346	.393

SQUARED MULTIPLE CORRELATIONS FOR X - VARIABLES

C5	C7	C10
.594	.641	.610

TOTAL COEFFICIENT OF DETERMINATION FOR X - VARIABLES IS .828

CHI-SQUARE WITH 2 DEGREES OF FREEDOM = .42 (P = .812)

GOODNESS OF FIT INDEX = .997
ADJUSTED GOODNESS OF FIT INDEX = .990
ROOT MEAN SQUARE RESIDUAL = .029

UNSPECIFIED TITLE

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -.038
MEDIAN FITTED RESIDUAL = -.003
LARGEST FITTED RESIDUAL = .038

STEMLEAF PLOT
```
- 2|87
- 0|9
  0|4
  2|48
```

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -.613
MEDIAN STANDARDIZED RESIDUAL = -.014
LARGEST STANDARDIZED RESIDUAL = .449

STEMLEAF PLOT
```
- 0|6
- 0|31
  0|144
```

UNSPECIFIED TITLE

STANDARD ERRORS

LAMBDA X

	KSI 1
C5	.076
C7	.076
C10	.076

THETA DELTA

C5	C7	C10
.091	.081	.087

UNSPECIFIED TITLE

T-VALUES

	KSI 1
C5	10.329
C7	10.329
C10	10.329

THETA DELTA

C5	C7	C10
4.618	4.251	4.499

THE PROBLEM USED 1448 BYTES (= .3% OF AVAILABLE WORKSPACE)

TIME USED : .7 SECONDS

```
-> lisrel
->  /matrix=in ('path matrix')
->  /da ni=11 no=80
->  /se /1 2  3 4  5 6 7 8 9 10 11/
->  /mo ny=11 ne=3 nk=0 ly=fu,fi ps=sy,fr   te=di,fr be=ze,fi
->  /le /one two three
->  /lk /intmot
->  /fi ly(1,1) ly(2,2) ly(5,3)
->  /fr ly(3,1) ly(4,2)
->  /fr ly(6,1) ly(7,3) ly(8,1)
->  /fr ly(9,2) ly(10,3) ly(11,2)
->  /va 1 ly(1,1) ly(2,2) ly(5,3)
->  /ou se tv ef.
```

L I S R E L 7.20

BY

KARL G JORESKOG AND DAG SORBOM

This program is published exclusively by

SCIENTIFIC SOFTWARE, Inc.
1525 East 53rd Street, Suite 906
Chicago, Illinois 60615, U.S.A.
(800)247-6113 or (312)684-4979


```
THE FOLLOWING LISREL CONTROL LINES HAVE BEEN READ :


DA NI=11 NO=80 XM=-0.989898D+09
KM FI=c:\windows\temp\spssb26.tmp FO
(5E14.6)
LA
 C1       C2        C3        C4        C5        C6        C7        C8
 C9       C10       C11
SE
1 2  3 4  5 6 7 8 9 10 11/
MO NY=11 NE=3 NK=0 LY=FU,FI PS=SY,FR   TE=DI,FR BE=ZE,FI
LE
ONE TWO THREE
LK
INTMOT
FI LY(1,1) LY(2,2) LY(5,3)
FR LY(3,1) LY(4,2)
FR LY(6,1) LY(7,3) LY(8,1)
FR LY(9,2) LY(10,3) LY(11,2)
VA 1 LY(1,1) LY(2,2) LY(5,3)
OU SE TV EF



UNSPECIFIED TITLE

                     NUMBER OF INPUT VARIABLES 11

                     NUMBER OF Y - VARIABLES   11

                     NUMBER OF X - VARIABLES    0

                     NUMBER OF ETA - VARIABLES  3

                     NUMBER OF KSI - VARIABLES  0

                     NUMBER OF OBSERVATIONS    80



UNSPECIFIED TITLE

       COVARIANCE MATRIX TO BE ANALYZED
```

	C1	C2	C3	C4	C5	C6
C1	1.000					
C2	.564	1.000				
C3	.489	.355	1.000			
C4	.416	.817	.076	1.000		
C5	.333	.540	.505	.276	1.000	
C6	.141	.351	.006	.326	.200	1.000
C7	.262	.483	.159	.278	.620	.350
C8	.241	.373	.152	.399	.202	.439
C9	.400	.728	.145	.794	.359	.430
C10	.256	.383	.290	.239	.578	.108
C11	.526	.526	.226	.671	.164	.090

COVARIANCE MATRIX TO BE ANALYZED

	C7	C8	C9	C10	C11
C7	1.000				
C8	.070	1.000			
C9	.389	.488	1.000		
C10	.640	-.107	.169	1.000	
C11	.000	.349	.667	-.114	1.000

UNSPECIFIED TITLE

PARAMETER SPECIFICATIONS

LAMBDA Y

	ONE	TWO	THREE
C1	0	0	0
C2	0	0	0
C3	1	0	0
C4	0	2	0
C5	0	0	0
C6	3	0	0
C7	0	0	4
C8	5	0	0
C9	0	6	0
C10	0	0	7
C11	0	8	0

PSI

	ONE	TWO	THREE
ONE	9		
TWO	10	11	
THREE	12	13	14

THETA EPS

C1	C2	C3	C4	C5	C6
15	16	17	18	19	20

THETA EPS

C7	C8	C9	C10	C11
21	22	23	24	25

UNSPECIFIED TITLE

INITIAL ESTIMATES (TSLS)

LAMBDA Y

	ONE	TWO	THREE
C1	1.000	.000	.000
C2	.000	1.000	.000

	[illegible]	[illegible]	.000
C4	.000	.933	.000
C5	.000	.000	1.000
C6	.217	.000	.000
C7	.000	.000	.837
C8	.438	.000	.000
C9	.000	.879	.000
C10	.000	.000	.822
C11	.000	.690	.000

COVARIANCE MATRIX OF ETA

	ONE	TWO	THREE
ONE	.723		
TWO	.585	.910	
THREE	.391	.363	.776

PSI

	ONE	TWO	THREE
ONE	.723		
TWO	.585	.910	
THREE	.391	.363	.776

THETA EPS

C1	C2	C3	C4	C5	C6
.277	.090	.722	.209	.224	.966

THETA EPS

C7	C8	C9	C10	C11
.457	.861	.297	.476	.566

SQUARED MULTIPLE CORRELATIONS FOR Y - VARIABLES

C1	C2	C3	C4	C5	C6
.723	.910	.278	.791	.776	.034

SQUARED MULTIPLE CORRELATIONS FOR Y - VARIABLES

C7	C8	C9	C10	C11
.543	.139	.703	.524	.434

TOTAL COEFFICIENT OF DETERMINATION FOR Y - VARIABLES IS .996

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

ONE	TWO	THREE
.000	.000	.000

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .000

UNSPECIFIED TITLE

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

LAMBDA Y

	ONE	TWO	THREE
C1	1.000	.000	.000
C2	.000	1.000	.000
C3	.617	.000	.000
C4	.000	1.040	.000
C5	.000	.000	1.000
C6	.691	.000	.000
C7	.000	.000	1.055
C8	.798	.000	.000
C9	.000	.985	.000
C10	.000	.000	.959
C11	.000	.798	.000

COVARIANCE MATRIX OF ETA

	ONE	TWO	THREE
ONE	.406		
TWO	.461	.771	
THREE	.268	.311	.607

PSI

	ONE	TWO	THREE
ONE	.406		
TWO	.461	.771	
THREE	.268	.311	.607

THETA EPS

C1	C2	C3	C4	C5	C6
.594	.229	.846	.166	.393	.807

THETA EPS

C7	C8	C9	C10	C11
.325	.742	.252	.442	.509

SQUARED MULTIPLE CORRELATIONS FOR Y - VARIABLES

C1	C2	C3	C4	C5	C6
.406	.771	.154	.834	.607	.193

SQUARED MULTIPLE CORRELATIONS FOR Y - VARIABLES

C7	C8	C9	C10	C11
.675	.258	.748	.558	.491

TOTAL COEFFICIENT OF DETERMINATION FOR Y - VARIABLES IS .990

SQUARED MULTIPLE CORRELATIONS FOR STRUCTURAL EQUATIONS

ONE	TWO	THREE
.000	.000	.000

TOTAL COEFFICIENT OF DETERMINATION FOR STRUCTURAL EQUATIONS IS .000

CHI-SQUARE WITH 41 DEGREES OF FREEDOM = 184.99 (P = .000)

```
GOODNESS OF FIT INDEX = .716
ADJUSTED GOODNESS OF FIT INDEX = .543
ROOT MEAN SQUARE RESIDUAL =      .120


UNSPECIFIED TITLE


SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL =    -.352
  MEDIAN FITTED RESIDUAL =     .000
 LARGEST FITTED RESIDUAL =     .339


STEMLEAF PLOT
- 3|51
- 2|62
- 1|765442
- 0|9887766555322211000000000000000
  0|11223335667778
  1|0233566
  2|234
  3|4


SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL =   -4.456
  MEDIAN STANDARDIZED RESIDUAL =     .000
 LARGEST STANDARDIZED RESIDUAL =    3.844


STEMLEAF PLOT
- 4|53
- 3|840
- 2|332200
- 1|98853210
- 0|886322110000000000000
  0|1234688
  1|013345699
  2|0144488
  3|778


LARGEST NEGATIVE STANDARDIZED RESIDUALS

RESIDUAL FOR       C4 AND       C3 =  -4.456

RESIDUAL FOR      C10 AND       C8 =  -3.752

RESIDUAL FOR      C11 AND       C2 =  -3.021

RESIDUAL FOR      C11 AND       C7 =  -3.409

RESIDUAL FOR      C11 AND      C10 =  -4.276


LARGEST POSITIVE STANDARDIZED RESIDUALS

RESIDUAL FOR       C3 AND       C1 =   3.710



RESIDUAL FOR       C5 AND       C2 =   3.713

RESIDUAL FOR       C5 AND       C3 =   3.844

RESIDUAL FOR       C7 AND       C2 =   2.791

RESIDUAL FOR       C8 AND       C6 =   2.807


UNSPECIFIED TITLE


STANDARD ERRORS
```

	ONE	TWO	THREE
C1	.000	.000	.000
C2	.000	.000	.000
C3	.213	.000	.000
C4	.000	.091	.000
C5	.000	.000	.000
C6	.216	.000	.000
C7	.000	.000	.162
C8	.222	.000	.000
C9	.000	.094	.000
C10	.000	.000	.154
C11	.000	.109	.000

PSI

	ONE	TWO	THREE
ONE	.152		
TWO	.117	.159	
THREE	.094	.100	.162

THETA EPS

C1	C2	C3	C4	C5	C6
.125	.050	.143	.044	.093	.139

THETA EPS

C7	C8	C9	C10	C11
.092	.133	.053	.096	.088

UNSPECIFIED TITLE

T-VALUES

LAMBDA Y

	ONE	TWO	THREE
C1	.000	.000	.000
C2	.000	.000	.000
C3	2.893	.000	.000
C4	.000	11.484	.000
C5	.000	.000	.000
C6	3.192	.000	.000
C7	.000	.000	6.527
C8	3.599	.000	.000
C9	.000	10.431	.000
C10	.000	.000	6.211
C11	.000	7.328	.000

PSI

	ONE	TWO	THREE
ONE	2.665		
TWO	3.958	4.859	
THREE	2.844	3.096	3.749

THETA EPS

C1	C2	C3	C4	C5	C6
4.738	4.549	5.933	3.727	4.212	5.815

THETA EPS

C7	C8	C9	C10	C11
3.543	5.580	4.768	4.625	5.814

UNSPECIFIED TITLE

TOTAL AND INDIRECT EFFECTS

THE PROBLEM USED 12224 BYTES (= 2.4% OF AVAILABLE WORKSPACE)

TIME USED : 6.2 SECONDS