ENHANCING FLOW ANTECEDENTS TO PROMOTE FLOW AND INCREASE BASKETBALL SHOOTING PERFORMANCE

Phatsorn Waraphongthanachot

Student ID: 3907291

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ABSTRACT

In this thesis, I examined the impact on flow and shooting performance of imagery interventions designed to increase proposed antecedents of flow, illuminating mechanisms underlying the positive experience of flow in basketball players. Flow is a positive psychological state that is associated with high levels of enjoyment, intrinsic motivation, and performance, so athletes and coaches aim to optimize flow. Imagery is a powerful technique that has been shown to enhance performance and flow state in sport. Stavrou and Zervas (2004) proposed that five dimensions of flow are antecedents that can enhance the experience of flow. This thesis comprises three studies with parallel structure, using a pre-test, intervention, post-test study design. In pre-test and post-test, participants performed 40 shots (eight trials x five locations around the basketball key) at 4.5 metres (2-point) and 40 shots (same five angles) at 6.75 metres (3-point). In the Imagery condition, participants completed six 15-minute imagery sessions over two weeks, focusing on the designated antecedent dimension. The Video Placebo condition involved equivalent attention focused on watching video of basketball game competition. Participants were randomly assigned to conditions. I used Two-way Mixed-design ANOVA and Tukey post hoc tests to examine shooting performance and all nine flow dimensions in all three studies. In Study 1, I examined whether the imagery of three flow dimensions, challenge-skill balance (C-S balance), clear goals, and unambiguous feedback, enhanced flow states and increased shooting performance with 18 male and 8 female basketball players. The Flow Antecedents Imagery condition involved imagining clear goals and unambiguous feedback of shooting in an individualised C-S balance context. The Video Placebo condition involved equivalent time watching video of elite performers shooting in competition. Results indicated that the Flow Antecedents Imagery intervention enhanced the three targeted flow dimensions, C-S balance, clear goals, and unambiguous feedback, as well as global flow with significant interaction effects. The Flow Antecedents Imagery condition improved 2-point, 3-point, and total shooting significantly more than the Video Placebo condition. In Study 2, I examined the impact of an imagery intervention designed to increase total concentration on flow and performance with 18 male and 12 female basketball players. Flow is the feeling athletes get when they are totally absorbed in their sport, whether in training or competition. Thus, total concentration is a key antecedent dimension of flow. The Flow Antecedents Imagery condition involved imagining total concentration on shooting. The Video Placebo condition involved equivalent time watching video of game competition. Results indicated that the Flow Antecedents Imagery condition increased all nine flow dimensions and improved 2-point and total shooting significantly more than the Video Placebo condition. In Study 3, I examined the impact of an imagery intervention designed to increase sense of control on flow and performance with 16 male and 14 female basketball players. This involves imagining individuals feeling calm and confident during basketball shooting performance. The Flow Antecedents Imagery condition involved imagining feeling relaxed, calm, and confident while shooting. The Video Placebo condition involved equivalent time watching video of game competition. Results showed that the Imagery condition improved 2-, 3-point, and total shooting significantly more than the Video Placebo condition. Imagery of sense of control enhanced basketball-shooting performance, but significant pre-test differences interfered with effects of imagery on flow dimensions. In the three studies in this thesis, I found substantial evidence supporting the role of imagery of the five antecedents of flow as an effective technique for enhancing global flow state, flow state dimensions, and performance, which should promote further research on the antecedents of flow in sport.

STUDENT DECLARATION

I Phatsorn Waraphongthanachot, declare that the PhD thesis entitled "Enhancing Flow Antecedents to Promote Flow and Increase Basketball Shooting Performance" is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

[redacted]

Signature พรรษสรณ์ วราพงศ์ธนโชติ Date 22/3/2019

(Phatsorn Waraphongthanachot)

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Flow is a key concept in positive psychology. Positive psychologists talk of "being in flow". Flow is a peak experience associated with enjoyment, motivation, and performance in sport (Csikszentmihalyi, 1975). Flow is the experience people have when they are so engaged in what they are doing that they become unaware of everything else, even time. Having flow in one's life is a major source of both immediate pleasure and overall wellbeing (Csikszentmihalyi, 1990). Flow is difficult to generate, insofar as it usually comes and goes unexpectedly. Finding ways to enhance flow, so that it leads to these positive outcomes is an ongoing challenge in sport (Jackson & Csikszentmihalyi, 1999).

Csikszentmihalyi (1975) identified nine psychological dimensions of flow, namely challenge-skill balance, merging of action and awareness, clear goals, unambiguous feedback, total concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience. These dimensions have since been confirmed in sport (Jackson, 2011), where they are measured by the well-validated Flow State Scale-2 (Jackson & Eklund, 2002). Stavrou and Zervas (2004) proposed that five of these psychological dimensions should be considered antecedents of flow, the presence of which facilitates the experience of flow. These are challenge-skill balance, clear goals, unambiguous feedback, total concentration on the task at hand, and sense of control. The other four flow state dimensions should be considered concomitants, that is, they are experienced only when athletes are already in flow. The concomitants are action-awareness merging, loss of self-consciousness, transformation of time, and autotelic experience,

Flow is a feeling that athletes get when they are totally absorbed in their sport, whether in training or competition. Flow is important to sports performers because it has three effects that support players, namely enjoyment, motivation, and performance enhancement. When players experience flow, they find their sport participation highly enjoyable and want to play again, whether in practice or competition. Kimiecik and Harris (1996) concluded that enjoyment refers to "an optimal psychological state that leads to performing an activity primarily for its own sake and is associated with positive feeling states" (p. 259). Such high levels of enjoyment are related to wanting to do more training, to practice more often, and to compete more just for the pleasure and satisfaction of playing, which is the essence of intrinsic motivation. Furthermore, it is an enjoyable experience that leads to increased intrinsic motivation and associated peak experience. Intrinsic motivation is motivation to perform an activity for the sake of that activity itself, not for external rewards. Coaches and athletes desire to be intrinsically motivated because it leads to increased effort and persistence (Deci & Ryan, 1985). Training and competing more, especially with a sense of enjoyment and intrinsic motivation, often leads to enhanced performance. Given the desirability of experiencing flow for the enjoyment of an activity, the intrinsic motivation to continue the activity, as well as for performance, it is important to examine ways to facilitate the five psychological antecedents and determine whether flow increases, as well as to test how this affects performance. One of the techniques that can be used to increase these antecedents of flow state is imagery.

Imagery is a psychological process that is widely used in sport to enhance performance and to modify psychological variables, including key antecedents of flow (Koehn, Morris, & Watt, 2013). Imagery is a mental process that is nearly always operating in most people (Morris, 2010). Imagery is a psychological process that can enable one to imagine situations previously experienced, and even to create experiences that individuals have never had. It also can be improved and applied systematically in many contexts. Imagery has been used as a psychological skill in many ways to enhance peak performance in sport, and researchers have reported that imagery can enhance flow state (e.g., Munroe-Chandler & Morris, 2011; Pates, Cummings, & Maynard, 2002; Pates, Oliver, & Maynard, 2001). Morris, Spittle, and Perry (2004) stated that imagery in sport is mainly used for learning and practising skills, developing tactical skills and strategies, previewing performance, reviewing performance, as well as facilitating recovery from injury and heavy training. Imagery is also used to enhance psychological variables, such as motivation, confidence, and concentration, as well as to reduce anxiety. Imagery has a powerful impact on behaviour in sport because all thoughts and emotions affect how competitors play. Thus, imagery has been applied widely for performance enhancement in sport (Morris, Spittle, & Watt, 2005). Carboni et al. (2002) found a significant effect of brief imagery on free-throw shooting performance and concentration style of intercollegiate basketball players. Researchers showed that five of the six players rated that the imagery was useful for their performance and stated that they would continue to use the imagery after the conclusion of the intervention.

Researchers have investigated imagery as a psychological technique to increase flow state in sport and related areas. Koehn, Morris, and Watt (2014) studied the impact of an imagery intervention to increase flow state and performance in tennis competition. Using a single-case design with four highly-skilled, junior tennis players, Koehn et al. reported that after a 6-week imagery training period, three participants showed a continued increase in flow experiences and all four participants developed their service performance, groundstroke performance, and national ranking list position. Jeong (2012) examined the effect of imagery training on flow and performance in Korean professional dancers. Her intervention study showed that flow and relaxation imagery were both effective for enhancing optimal positive experience and performance in dance. Thus, along with the studies conducted by Pates et al., this research indicates that imagery interventions can enhance flow state.

However, no studies have specifically examined the mechanisms by which imagery enhances flow state. Studying the impact on the experience of flow in sport of imagery interventions designed to increase the proposed antecedents of flow has the potential to throw light on the mechanisms underlying the way imagery enhances the powerful, positive experience of flow in sport. Previous research indicates that imagery interventions can enhance flow and increase performance (e.g., Jeong, 2012; Koehn et al., 2014; Munroe-Chandler & Morris, 2011). Flow is important to performers in sport because of three possible outcomes of flow that support athletes, namely enjoyment, intrinsic motivation, and performance. The major antecedents that contribute to the flow experience are challenge-skill balance, clear goals, unambiguous feedback, concentration on the task at hand, and sense of control (calmness/relaxation, confidence). Imagery training is a technique that can be used to enhance these antecedents of the flow state because the antecedents correspond closely to the major components of psychological skills training (goal setting, concentration, relaxation, confidence) and imagery has frequently been shown to enhance these. Thus, in the three studies in this thesis, I examine the efficacy of imagery training to promote the five antecedent dimensions of flow with the aim of increasing global flow state and specific flow state dimensions and enhancing performance in sport.

CHAPTER 2 LITERATURE REVIEW

Introduction

Athletes who perform at their best frequently report a mental state in which they are very focused and absorbed in the activity. They have a strong sense of control with mind and body as one. This mental state not only has the potential to enhance performance, it also helps with the intrinsic motivation in terms of feeling joyful and wanting to do more of the performed for its own sake. Csikszentmihalyi (1975) clearly identified, defined and delineated this state as “flow”. Flow is the people’s experience of being so engaged with the task at hand as they become unaware of everything else, even time. Mientkiewicz, a baseball player of the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:

> I was like ‘Wow’, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion (From FSU star to Olympic Gold Hero, 2000).

Kimiecik and Harris (1996) had shown that enhancing flow can lead to increased enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enjoyment is a key concept connected with the flow experience and positive feeling states or emotion (Csikszentmihalyi, 1991). According to Motl, Berger, and Leuschen (2000) enjoyment often occurs in autotelic like performed for their own sake or intrinsically rewarding activities and seems to result in desirable affective states, such as happiness, pleasure, and relaxation. Intrinsic experience of harmonious enjoyment easily arises when mind and body work together (Jackson & Csikszentmihalyi, 1999). This leads to a feeling of being so involved in the activity that nothing else seems to matter and individuals continue to do the activity and to seek more opportunities to experience that positive state. Positive psychologists talk of “being in flow”. Flow is a peak experience associated with enjoyment, motivation, and performance in sport (Csikszentmihalyi, 1975). Flow is difficult to generate, usually coming and going unexpectedly. Finding ways to enhance flow, leading to these positive outcomes is a challenge in sport (Jackson & Csikszentmihalyi, 1999).

In this literature review, I first discuss all aspects of flow, including its definition, theories and models of flow, its nine dimensions and the proposition that certain dimensions are antecedents of flow and others are concomitants, and research on a number of aspects of flow in sport. This account of the nature and characteristics of flow enhances understanding of the ephemeral process of flow and how it is possible to facilitate flow. Then, I evaluate the link between flow and performance, especially considering how each antecedent dimension of flow can affect sport performance. During the past decade, several researchers have explored this area, but no systematic and structured research has been conducted to examine (Swann et al., 2012). if it is possible to facilitate flow experience in sport activities by enhancing its proposed antecedent dimensions. After evaluating these aspects of flow, I discuss the use of imagery as a suitable mental training method to facilitate flow in athletes. Although imagery is a well-known skill that can be employed to support many aspects of athletes’ performance and psychological state, there is no research that looks specifically into the application of imagery to increase specific dimensions of flow, especially the antecedents. The most interesting and important psychological processes in relation to flow, in combination with the use of imagery to enhance flow antecedents, I provide the foundation for original research in which I aim to enhance knowledge about the mechanisms underlying flow in sport performance. More specifically, this research will add to knowledge related to specific aspects of flow state that may affect basketball players’ shooting performance.

Flow in Sports

Csikszentmihalyi (1975) created the term “flow” after conducting interviews with participants in different skilled activities, including chess, music composing, dance, rock climbing, and surgery. Despite the different activities, Csikszentmihalyi found that the skilled performers shared similar characteristics that involved total focus and absorption in what they did. He claimed that, because the mind and body work synchronously, there is a sense of intrinsic reward, which gives skilled performers the motivation to keep doing the activities. Csikszentmihalyi concluded that people can experience flow in various skilled activities.

Although several researchers have operationalized flow, with different flow definitions. Csikszentmihalyi (1975) proposed this definition:

> Action follows upon action according to an internal logic that seems to need no conscious intervention by the actor. He experiences it as a unified flowing from one moment to the next, in which he is in control of his actions, and in which there is little distinction between self and environment, between stimulus and response, or between past, present, and future (p. 36).

Jackson and Csikszentmihalyi (1999) described when people are in flow, they become totally absorbed in what they are doing, and ignore other thoughts and emotions. Carter, River, and Sachs (2013) gave a broad definition of flow as “a person’s sense of joy, creativity and an experience of total involvement in life” (p. 17).

Sorrentino, Walker, Hodson, and Roney (2001) gave a different definition focusing on the interaction between person and situation factors:

> Feeling good about the self while engaging in the activity at hand. It occurs when the person engages in a situation that has a positive information value (attaining or maintaining clarity about the self for uncertainty-oriented vs. certainty-oriented persons, respectively) and the person is positively motivated to undertake the activity (p. 198).

Because of the variety of flow definition, Hoffman and Novak (2009) argued that there was a low consistency in definitions of flow that was used by different researchers. Kowal and Fortier (1999) echoed this sentiment about the “ambiguity concerning individual characteristics of flow” (p. 365).

In sport psychology, Jackson (1992) reported the first empirical study that examined flow. Jackson examined the nature of flow experience using the Experience Sampling Method (ESM). She individually interviewed 16 U.S. figure skaters who had an average of 13 years skating experience and frequently competed in world level competition. Jackson found that 81% of the athletes rarely experienced flow. Researchers showed it is not easy for athletes to acquire flow.

Sport based studies on flow been conducted at both elite and amateur levels. Jackson, Ford, Kimiecik, and Marsh (1998) conducted research at a variety of competitive levels in four different sports (swimming, cycling, track and field, and triathlon). The research was designed to examine potential psychological correlates of flow in a sample of older athletes. The participants were 398 athletes competing in a World Master’s level of competition and the majority (84%) of athletes from 13 nations came from Australia. The process of understanding flow in sport connections was supported through the demonstration of the relationships between flow and observed ability, anxiety, and intrinsic motivation variables. A significant amount of research has also been conducted on flow in occupational settings, in educational contexts, and research in non-competitive physical activity is also growing (e.g., Elbe, Strahler, Krustrup, Wikman, & Stelter, 2010; Jackson & Marsh, 1996; Koehn et al., 2013b).

Early Conceptualizations of Optimal Experience

Flow is a relatively recently devised hypothesis that has some common ground with other concepts that relate to high level or optimal experiences, including peak experience and peak performance. Thus, in this section, I describe each of those concepts and focus on both the differences and similarities.

Peak experience. Peak experience was first researched by Abraham Maslow (1962) on various groups, such as college students, friends, and mail recipients. He asked participants about their most joyous and happy moment in life and was able to categorise peak experience with 14 different characteristics. He developed an extensive list of peak experiences factors by individuals describing activities they perceived to be among the most thrilling, exciting, and fulfilling events in their lives. For example, the experiences involve deep absorption in an activity that holds substantial value and appropriateness to life. However, winning or ranking success would not necessarily to be involved. Maslow (1968) refers to moments of self-actualization, when individuals have attained complete satisfaction of lower-level physiological and social needs, the individual is "self-actualized" and encounters the extremely rewarding peak experience. Maslow's insights were innovative and important in that they encourage focus upon and study of self-actualization and similar events as measurable and explainable physiological phenomena. He has thus relocated human experiences that were previously and exclusively understood only as mystical or religious happenings into the realm of science, notably the science of psychology. Peak experience is described as a moment of highest happiness, or intense joy. Peak experience research also indirectly covers the concept of joy (Maslow, 1968;

Privette & Bundrick, 1997).

Following Maslow's concept of peak experience, Ravizza (1977) conducted the first research of peak experience in sport and found some characteristics that were similar to the research of Maslow. Ravizza used interview techniques to examine the athlete's personal experiences. Significantly, some of Ravizza's findings are very similar to flow characteristics, such as the feeling of total concentration, disorientation in time and space, a narrow focus of attention, a feeling of being in total control, and the absence of any fear of failure. In addition, Berger, Pargman and Weinberg (2007) stated a peak experience is "intense in that it requires considerable effort and high levels of concentration. Involvement of others in the exercise may inhibit occurrence of the peak experience because the required narrowed and acute attentional focus may be disrupted" (p. 290).

Peak performance. In sport psychology research, there has it always been interest in improving performance. Athletes who perform at their best and win tend to report that there is a state called "peak performance state" (Jackson & Eklund, 2004). Facilitating flow is an important goal in sport because flow can lead to enhanced performance (Swann et al., 2012). It is of great interest to athletes and coaches because of its link with peak experience and high performance (e.g., Garfield & Bennett, 1984; Jackson, 1992). Garfield and Bennett (1984) interviewed elite athletes and identified several factors critical to peak performance including physical and mental relaxation, confidence, deep focus, being highly energised, extraordinary awareness, feeling in control, and "in the cocoon" that is detached from the external environment and its distractions. Peak performance is superior functioning, releasing latent powers to behave effectively in athletic prowess, artistic expression, intellectual endeavours, interpersonal relationships, moral courage, or any activity (Berger et al., 2007). Peak performance is reflected through the optimal level of task engagement and the use of one's potential in any activity (Privette, 1981). Research by Privette and Bundrick (1991) reported deep focus and sense of control were highlighted as two distinguishing characteristics of peak performance. In order to identify whether or not the optimal state exists, researchers have used retrospective interviews to ask athletes about their perception when they were experiencing an optimal (peak) performance state.

Flow experience. Flow is a peak experience associated with enjoyment receptive relaxing time motivation, and performance in sport that leads to increased intrinsic motivation (Csikszentmihalyi, 1975). In addition, Csikszentmihalyi (1975; 1978; 1988; 2014) proposed that feelings of intrinsic motivation and a heightened sense of self are often associated with enjoyable immersion in the task at hand, which frequently happens when flow occurs during physical activities and sports. In any activity, flow has an impact on cognitive and emotional processes, leading to the idea that flow provides an optimal state for athletes, which has been supported through qualitative research (Jackson, 1995; Jackson & Roberts, 1992). Flow is the experience of being so engaged with the activity that individuals become unaware of everything else, even time passing. Understanding flow is important in helping to explain the rise and fall of motivation as people respond to the changes that occur in their environment (Csikszentmihalyi, 1988). The flow experience is perceived to include total concentration and absolute absorption in an activity. Individuals who are in flow experience can lead to a dynamic intrinsic motivation to perform without effort (Kimiecik & Harris, 1996). Research on national and international athletes (Jackson, Thomas, Marsh, & Smethurst, 2001) and professional athletes (Jackson et al., 1998) supported the Kimieck and Harris (1996) finding. Knowing the value of flow toward an athlete's enjoyment, motivation to continue the activity with increased effort and persistence, and the potential to enhance performance, it is therefore important to find ways to improve the dimensions of the antecedents of flow with the hope of facilitating an athlete's flow experience.

The literature in sport psychology uses three terms, flow experience, peak experience and peak performance to better describe this phenomenon of flow state. All three terms are used interchangeably to refer to special, sensational, extraordinary, and often highly gratifying moments in exercise or physical activity. Some characteristics of the optimal experience state overlap, and a representation of the overlapping elements and components shared by all three concepts are associated with the terms are absorption, joy, and valuing. The major similarities and differences between the three types of optimal experience are summarized in Table 2.1.

Table 2.1

Major characteristics of optimal experiences as cited in Berger, Weinberg, and Eklund (2015)

Flow State / Flow Experience	Peak Experience	Peak Performance
Complete concentration	Clear focus	Richness and intensity
Merging of action and awareness	High level of performance	Intense joy and happiness
Automaticity	*Automaticity*	*Spontaneity*
Complete control	Intentionality	Peace and acceptance
Enjoyment	Fulfilment	Fulfilment and sense of meaning
Loss of self-consciousness	Strong sense of self	Self-transcendence

Privette and Bundrick (1997) conducted research on the link between peak performance and peak experience. They found that peak performance is accompanied frequently by peak experience, but it is not always the case. Furthermore, they argue that peak experience and flow overlap in their effect and can occur at the same time. This view is echoed by Jackson (1996).

What sets flow apart from peak experience is its cognitive characteristics such as concentration, balance between the challenge of the event and the athlete's skill and having a clear goal. Peak performance refers to an outcome or achievement of superior functioning, rather than to an internal experience of optimal feelings and perceptions (Berger et al., 2007). Flow describes an inner psychological state while one is engaged in an effortful and challenging activity, whereas peak performance refers to the outcome or accomplishment as a consequence of that person's effort and sustained concentration. Simply put, peak performance refers to an outcome, such as a victory, a personal best, or a record, rather than to an experience.

Flow Theory

Precursors of Flow Theory

Csikszentmihalyi (1975) outlined the main theoretical foundations or precursors of flow theory, as shown in Figure 2.1.

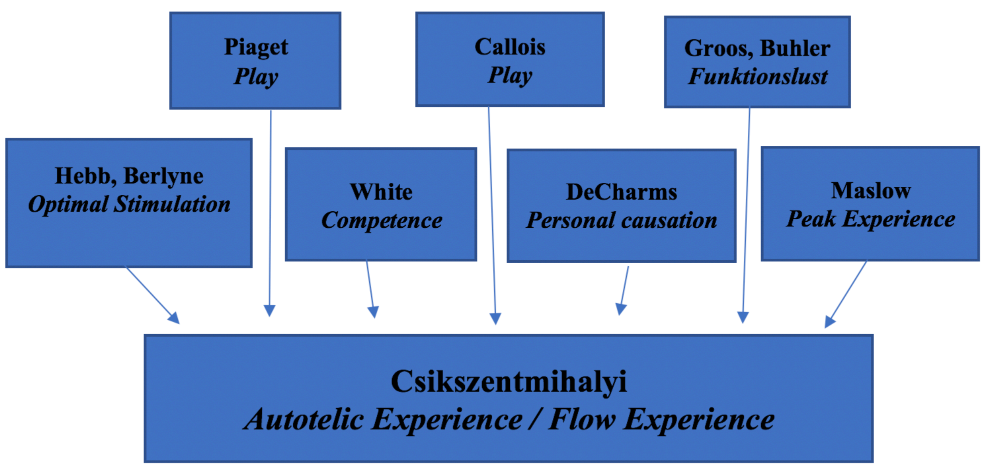

Figure 2.1. Theoretical precursors of Csikszentmihalyi's (1975) flow concept. (Adapted from Csikszentmihalyi, 1975, p.30).

Several researchers showed theorised flow characteristics and dimensions (e.g., Berlyne, 1960; Hebb, 1955; White, 1959). It was also proposed that the appropriate amount of stimulation is necessary to foster and promote intrinsically-motivated behaviour. Thus, it must be assumed that when individuals perform behaviours for their own sake, that is, when they are intrinsically motivated, aspects of those behaviours must be providing appropriate stimulation (Berlyne, 1960; Hebb, 1955). White (1959) observed athletes that novelty and variety are enjoyed for their own sake and proposed “effectance motivation”, that is, motivation for dealing with the environment. Individuals like to have the experience of enjoyment through their interactions within the environment that is, athletes consequently learn to deal with the environment and improve their skills as actions that support their own level of enjoyment.

Csikszentmihalyi (1975) referred to DeCharms (1968) who proposed the feeling of being the originator of the action is an important aspect of enjoyment. DeCharms’ suggested that being the originator of one’s actions is an important determinant of behaviour where the key concepts stimulated were the psychological needs of competence and autonomy, concepts based in Self-Determination Theory (SDT; Deci & Ryan, 1985). Piaget (1951) and Caillois (1958) explain the motivational aspects of play that is other precursors of Csikszentmihalyi’s flow theory considered to be proposition concepts. Piaget (1951) proposed that play delivers a glimpse of the child’s emerging cognitive structures in action while allowing young players to practice and support whatever competencies they possess. Caillois (1958) proposed that individuals find pleasure in play by testing limits, extending skills, having new experiences, seeking danger, and altering their consciousness.

Csikszentmihalyi (1975) also referred to the work of Groos (1899) and Bühler (1922) as precursors. They described the pleasurable sensation “Lust”, experienced when individuals function effectively. With regards to Bühler, the enjoyment lies in the sensation of effectance and control of action, and this is an essential motivational aspect for understanding human behaviour.

Bühler (1922) proposed that funktionslust is a type of innate reward mechanism provided by evolutionary means to ensure the development of skills. Csikszentmihalyi conceived flow as having parallels to peak experiences, as described by Maslow (1968), and in many respects to the experience in rituals, meditation, and other forms of religious experience (Csikszentmihalyi 1975). Thus, the focus of this section is more on the Csikszentmihalyi's theory, because broad areas of consensus exist in relation to the current theory in the field of flow in sport.

Flow Models

Csikszentmihalyi (1975) proposed the first flow model, which relied mainly on the balance between challenge and skill (see Figure 2.2). Flow is most likely to occur when challenge and skill (C-S) match, but it does not occur when C-S do not match. When there is an imbalance and challenges are too demanding for an individual's skills, consequential concern and anxiety might be observed. If skills exceed challenge, boredom is often experienced and in other contexts relaxation can be the outcome. The model of flow state explains the elements that generate flow state and cause flow to occur more often.

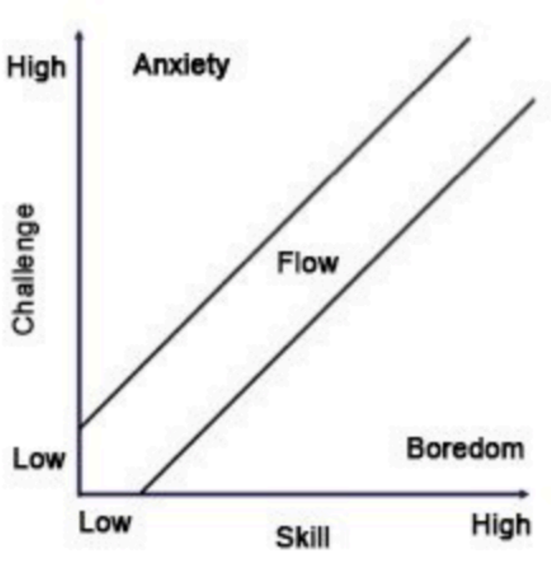

Figure. 2.2 Csikszentmihalyi (1975) the first flow model

Following the first model of flow from Csikszentmihalyi (1991; 1993; 1997), Jackson and Csikszentmihalyi (1999) adapted a model for the specific peak experience of flow as a delicate balance between skill level and challenge demands (see Figure 2.3). This model describes four relationships between challenge and skill, represented by the four quadrants of the figure. The bottom left quadrant represents a situation in which both the perceived challenge of the task and the skill level are low. In this situation, individuals are likely to experience apathy. The bottom right quadrant depicts situations in which skill exceeds the challenge, so the task is too easy, and individuals are likely to experience relaxation or boredom. The top left quadrant reflects the situation in which an individual's level of skill is inadequate to meet the challenge posed by the task. In situations like this, where the challenge is too difficult for skill level, individuals are likely to experience anxiety. The enjoyable, pleasurable, and rewarding experience of flow results when the challenge presented by the task and the level of skill that individuals possess are in balance and both are relatively high, as reflected in the top right quadrant of the model.

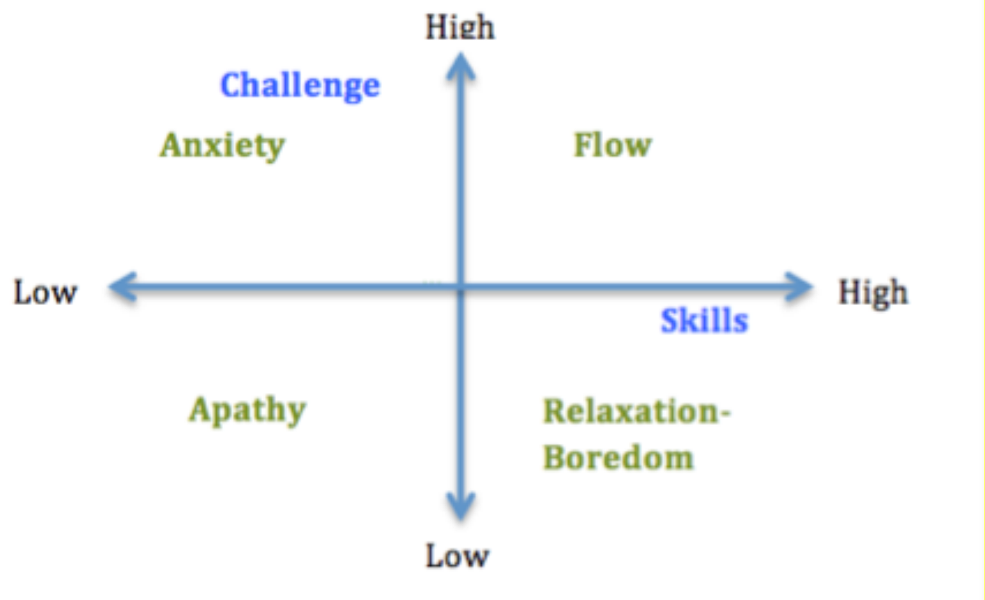

Figure 2.3. Model of the flow state adapted from Jackson and Csikszentmihalyi (1999)

Flow Dimensions

It is not easy for athletes to get into flow due to its ephemeral characteristics. Finding the best approach to facilitate flow and to help athletes both in performance and enjoyment is a real challenge. A flow structure consisting of nine dimensions, namely C-S balance, merging of action and awareness, clear goals, unambiguous feedback, total concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience was proposed (Csikszentmihalyi, 1975; 1990; Jackson & Csikszentmihalyi, 1999). Jackson (2011) confirmed the role of these dimensions on the flow in sport.

Challenge-Skill Balance. Challenge-Skill Balance (C-S Balance) relates to the experience individuals have when athletes find a task challenging, but they perceive that they have the skill to meet the challenge. Challenges in sport come in a variety of forms, including physical, mental, and technical challenges (Williams, 2008). Athletes' location in the space represented by the orthogonal challenge and skill continua depends on their perception of the challenge and the level of confidence they possess about their skill. Hence, in order to facilitate flow, athletes need to perceive a situation to be challenging enough for it to match their level of skill. When a challenge is perceived to be too difficult for athletes' present skill level, they can either improve their skill through practice or find a less challenging situation, such as opponents with lower skill levels. Competition circumstances can be challenging for athletes, but they may have the skill to rise to the challenge when they stretch beyond their comfort zone. This depends on the athletes' perception of the challenge and the perception of their skill. The enjoyable, pleasurable, and rewarding experience of flow results when the challenge presented by the task and the level of skill which individuals possess are in balance and both are relatively high (Csikszentmihalyi, 1988). According to Csikszentmihalyi (1975) and Jackson (1995), C-S balance is a precondition for getting into flow.

Clear Goals. The target that the athlete is working toward is obvious to them. Only when the athlete is sure of what they need to do to achieve the goal are they able to focus and put in the effort. Together with C-S balance, having a clear goal is considered to be the foundation for flow (Jackson, 1996). Because of their strong awareness in what they are doing, the clear goal gives athletes a sense of direction regarding where they are going. For example, when athletes describe optimal sport experience, two matters related to goals stand out. Firstly, it is a clear blueprint of what one intended to do, such as “I knew exactly how I was going to swim the race and I knew what I had to do”. Secondly, athletes often report having the perception before an event that their performance is going to be good. They report with such phrases as “being confident of a quick time”, “seeing myself doing exactly what I want to do”, and “I knew at a certain point that I was going to take off and there would be no stopping me,” thus illustrating their positive convictions (Jackson & Csikszentmihalyi, 1999).

Unambiguous Feedback. When informing athletes about whether or not their activities are heading in the right direction to their goals, the type of feedback can either be based on kinaesthetic awareness or external factors. It gives athletes a clear idea about how well they have been doing in an ongoing manner. It also assists athletes in keeping themselves on the right track to success. Awareness of the quality of the outcome as it occurs and of how it matches an ideal outcome is a skill that allows athletes to know moment by moment whether they are creating their desired abilities. They also can create adjustments as required to maintain the current level or return to an optimal level. Feedback is critical to achieve optimal performance, and athletes who are utilising the feedback given by their own movements and bodies, as well as by external cues in the environment, are able to remain connected with what they are doing and in control of where they are headed (Jackson & Csikszentmihalyi, 1999). Feedback also can be external to the performer. For example, a tennis player knows when he/she swings the racket whether their positioning is correct or needs adjustment. This automatic response to what is happening around oneself occurs when the feedback is coming clearly and immediately, as it does in a flow state.

According to Jackson and Csikszentmihalyi (1999), there are different ways feedback can affect people. In regards to athletes who have a physical component to what they do when in flow, one of the most main sources of "feedback is kinaesthetic awareness or knowing the spatial location of body". This awareness is the internal information an athlete needs to optimise his or her movements. Recognizing how the quality of a feedback relates to an ideal performance enables athletes to know, on a continuous basis, whether their movements match what they want them to be. Feedback can also come from a range of external sources, including the environment in which the performance is occurring, to the information provided by competitors or spectators. It is not necessary for feedback to always be positive for flow to be experienced. When receiving feedback associated with a flow state, the performer does not need to stop and reflect on how things are progressing. This information is seamlessly integrated into performance in an ongoing way.

Concentration on the Task at Hand. Athletes have total focus on what needs to be done to the extent of ignoring external distractions. In flow, an athlete's mind is totally occupied with what they are doing and feeling right at that their activity. There is no extra energy or time wasted thinking about irrelevant or unhelpful thoughts (Jackson & Csikszentmihalyi, 1999). For example, Simon is an Olympic cyclist. He described in his cycling an experience of a narrow focus without even being aware of looking around. "Concentration is one of the crucial elements and characteristics of flow experience mentioned most often. Learning to exclude irrelevant thoughts from consciousness and instead to tune in to the task at hand is a sign of a disciplined mind." (p. 25) Jackson & Csikszentmihalyi (1999). Athletes still need total concentration on their activities to attend to what must be done when goals are clear, feedback immediate, and engaged with appropriate challenge abilities.

Sense of Control. Athletes feel that they can regulate their activity to achieve the expected result within the given environment. A sense of total control comes from having confidence that their skill level is high enough to excel in challenging situations (Jackson & Csikszentmihalyi, 1999). This sense of control strengthens their self-belief about their capability and leads to a feeling of calmness and strength. Recalling how people get into a flow state, they report feeling that they can do no right or wrong, like a feeling of invincibility. The sense of control frees the athletes from the anxiety of failure and creates a feeling of empowerment for the challenging tasks that are yet to be completed. More than actually being in control, it is knowing that if athletes try hard, they can be in control, they trust their skills and they know that the task is achievable. The performance related demonstration of this knowledge is framed within a sense of power, confidence, and calmness.

Action-Awareness Merging. When athletes are experiencing the feeling of total absorption in an activity that they are executing, they may feel fully immersed in what they are doing and consequently they perform the task automatically. The mind and body seem to be as one and athletes are not conscious about the movement. The body movement becomes effortless and fluent (Csikszentmihalyi, 1990). For example, rowers explained that the oar becomes an extension of the arm, a basketball player literally feels a part of the team akin to the arms feeling like part of the body, and when they shoot a basket, the arc of the ball toward the hoop is like an extension of their mind (Jackson & Csikszentmihalyi, 1999). Therefore, action and awareness merge only when athletes become totally absorbed in what they are doing. This comes about when athletes feel that they have the skills to meet the challenge and when they focus all their attention on the task at hand. As with all the flow dimensions, the merging of action and awareness is part of a holistic experience and dependent on the other components.

Loss of Self-consciousness. Fear of being judged by others is kept in check during the time when athletes are in flow (Jackson & Csikszentmihalyi, 1999). They lose their concern about how their activities may be judged or regarded by outsiders. There is no concern for social evaluation. The self is fully functioning with all of the necessary attention resources, but not fully aware of how the task is achieved. Hence, athletes are able to perform well under high-pressure game situations without self-doubt or fear. This dimension is closely united with the merging of action and awareness. Not worrying about oneself frees the self to become totally involved in the activity. Similarly, being one with the activity prevents thoughts related to the self from creeping in and disturbing the moment. When athletes speak of becoming one with the activity, they are also referring to freeing themselves of self-consciousness.

Transformation of Time. Time transformation may be the least frequently experienced flow dimension. Sport research conducted to date has found lack of a robust association between time transformation and the other flow dimensions. It may be that the nature of the sports activity, where time is often part of the infrastructure or part of the challenge, is not easily lost. Another possible explanation is that this dimension of flow occurs only when the flow experience is very deep (Tenenbaum, Fogarty, & Jackson, 1999). When time transformation is experienced, it is one of the liberating dimensions of flow to feel free from the dependence of time under which we live most of our lives.

Because athletes are so immersed in their activities, they may perceive the passage of time to be different from how it is in reality. The event may feel like it is passing by very fast, with time passing by quicker than they thought. Generally, what is experienced in flow is a shortening of time, so that hours pass by like minutes, or minutes like seconds. This indicates that the transformation of time is a by-product of total concentration. When you are focused entirely on the task, you cannot keep track of the passing of time, which, when you reflect back on the event, can lead to altered perceptions of how the time has passed. When you are concentrating, you can forget time, so that an event may seem to have finished “before you knew it”. The slowing down of time can also be related to concentration: when your mind is really focused, you absorb information with more clarity. Some other athletes in flow experience the total opposite, which is the slowing down of time and their performance. For example, a fast-pitched softball coming toward your bat can seem to be slow as you notice even the seams and the curve of the ball all in a matter of milliseconds before the bat makes contact (Jackson & Csikszentmihalyi, 1999). Because nothing else is entering our awareness during the intense concentration of flow, we may be surprised to find that significant time has passed while in this state. The intensity of focus may also contribute to perceptions of time slowing, with a feeling of having all the time in the world to execute a move that is in reality time-limited. Thus, there seems to be a close link between depth of concentration and time transformation.

Autotelic Experience. Flow is an autotelic experience, which is another way of indicating something that is intrinsically rewarding. The word *autotelic* comes from two Greek words meaning “self” and “goal”. Thus, autotelic activities are those that need no other justification because athletes have a built-in goal. The goal is simply to do the activity for its own sake, or more precisely, for the experience it provides. Athletes can play sport for sheer enjoyment, that is, for autotelic reasons. Flow is experienced as being highly rewarding, and individuals strive to attain this state repeatedly. Csikszentmihalyi (2014) described the flow or autotelic experience in the following words: “the state in which people are so intensely involved in an activity that nothing else seems to matter, the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it” (p.137). The desire to engage in an activity for its own sake typically is referred to as “intrinsic motivation” (Deci & Ryan, 1985; Rheinberg, 2008). It gives a person a feeling of enjoyment and this is intrinsically motivation. Kimiecik and Harris (1996) propose that this autotelic experience helps athletes to enjoy their sport not because of any expectation about future benefit but rather because of the intrinsic motivation that stems from having done this activity. Jackson (1992; 1995) suggests that this attribution is only a consequence of flow. The perception of performing perfectly is another component of enjoyment and a result of being in flow. Athletes report being left on a high, feeling great, and having experienced something extremely rewarding. Csikszentmihalyi (1975; 1990) proposed the idea that there is an autotelic personality trait that helps some people to get into flow more easily. This ability might be linked to their individualised characteristics of internal enjoyment or openness to absorbing and merging with their activities.

Because of the autotelic experience that is part of the flow dimensions, people in flow will tend to enjoy their physical activities more, which leads to a more positive experience. Athletes will be more likely to repeat this activity again for the sake of their internal enjoyment. According to Martens (1987), if coaches and sport psychologists can understand the structure of flow and how athletes feel when they are in flow, they may be able to support their athletes or team in their efforts to gain more optimal experiences. However, the concern arises when coaches and sport psychologists shift their focus to improving performance outcome rather than improving the athlete’s optimal experience, since by doing so will go against the nature of the flow experience (Csikszentmihalyi & LeFevre, 1989). Csikszentmihalyi (1990) emphasised that flow is self-fulfilling in the sense that people are in flow not to gain some future benefit, but rather because they enjoy the process of doing what they are doing (autotelic experience).

Antecedents and Concomitants of Flow

Nine flow dimensions identified by Csikszentmihalyi (1975) have also been confirmed in sport by Jackson (2011). Stavrou and Zervas (2004) separated the nine dimensions into two groups namely, antecedent and concomitant dimensions. According to Stavrou and Zervas, these two groups have different impacts on the experience of flow by athletes. The antecedent dimension group includes C-S balance, clear goals, unambiguous feedback, total concentration, and sense of control. These factors are considered to be precursors of the flow experience because these factors can help flow to occur. The concomitant dimension group includes merging of action awareness, loss of self-consciousness, time transformation, and autotelic experience. Concomitant dimensions occur as the consequence of the athlete getting into flow. Antecedents are dimensions that facilitate the experience of flow when they are on a high (performed for their own sake). Thus, this factor occurs before flow and helps to bring flow on. Concomitants are experiences that are reported by people in flow, thus, usually occurs when they have attained flow. The distinction between dimensions that are essential to achieve flow antecedents, and dimensions that signify the phenomenological experience during optimal states concomitants, has been identified with two different kinds of function that Nakamura and Csikszentmihalyi (2002) called flow conditions and flow characteristics. Flow conditions or the dimensions that seem to be important to attain flow, are equivalent to antecedents, whereas, flow characteristics or the dimensions that people experience when they are in flow, seem to correspond to concomitants. Nakamura and Csikszentmihalyi also found support for the arguments that C-S balance and clear goals are central for the flow experience across sports. Stavrou and Zervas (2004) also reported that the presence of these conditions, as well as unambiguous feedback, total concentration, and sense of control, facilitated the experience of flow, whereas the concomitants were only experienced when athletes were in flow. Given the desirability of experiencing flow for motivation to continue the activity with increased effort and persistence, as well as the potential to enhance performance, it is important to examine ways to facilitate these psychological antecedents and determine whether flow increases, and to test how this affects performance. The salient question is how each of the antecedent dimensions helps to facilitate flow in athletes. Koehn, Morris, and Watt (2013a) were among the first group of researchers that looked at improving flow experience in junior tennis players using imagery on antecedent dimensions. The results of this study discussed the development of an imagery intervention targeting the improvement in groundstroke performance, service performance and enhanced flow experience in tennis competition.

Personal Factors Affecting Flow

The outline of the interaction between personal factors and situational factors that create flow were proposed by Kimiecik and Stein (1992). According to this flow model, experience of flow does not happen because of either the situational factors or personal factors, but an interaction between both factors. This personal variable can be subdivided into two groups: “dispositional factors” and “state factors”. Dispositional factors include the following: goal orientation (task or ego), attentional style, trait anxiety, trait confidence, and perceived sport competence. State factors include the following: game goals, concentration, state anxiety, self-efficacy, and perceived game ability. Situational factors include the following: the type of sport (self-paced vs. other-dependent, individual vs. team, and open vs. closed skills), competition importance, opponent ability, coach behaviour, teammate interaction and behaviour, and competitive flow structure. Previous researchers also found other personal variables including: length of sport involvement and skill level, gender, and confidence which may also affect flow (e.g., Hagger & Chatzisarantis, 2007; Kimiecik & Stein, 1992; Koehn & Morris, 2014).

Length of Sport Involvement. Grove and Lewis (1996) conducted research on exercise and flow. They examined the influence of hypnosis on flow experience states during circuit training and found that participants with at least six months of training experience tended to report more flow experiences. The results revealed an increased flow experience from pre-test to post test and that change was greater for the participants high in hypnosis susceptibility.

Skill Level. Catley and Duda (1997) found a significant relationship between flow and skill level. Due to their experience of frequent training and competing in very challenging conditions, elite athletes may have developed more mental capability to deal with challenges and hence enhance their flow experiences. This finding is supported by Koehn and Morris (2014) when they found a significant main effect for skill level. It shows that more highly elite ranked tennis players have a higher flow score than club-rank players. Jackman, Van Hout, Lane, and Fitzpatrick (2015) also examined the flow experiences of horse riders and determined their experiences supported the occurrence of flow. The athletes' skill level influences their level of commitment and enjoyment, which indirectly affects flow state. When an athlete has just started learning a sport, he/she enjoys more of the activities. As the skill improves, so does the level of commitment that is needed to progress further. At that time, many athletes focus more on the commitment to train and consequently, begin losing the internal enjoyment of playing sport (Casper & Andrew, 2008). Koehn's (2007) review of flow in sport proposed that personal factors and situational factors interact and can influence the balance between personal skills and current challenges in a structured activity that is significant to the self, and positively influences cognitive and motivational processes, being exclusively directed on the task at hand and leading to a holistic state absorption characterised and positive affect, as an autotelic experience.

Gender and Sport Type. Russell (2001) explored the connection between gender and flow, using both qualitative and quantitative data collected from college athletes. There were no significant differences reported, a result similarly found by Jackson and Marsh (1996). Russell (2001) also combined both the interview and the FSS questionnaire (Jackson & Marsh, 1996) to examine flow in college athletes, and the sample included team and individual athletes. The result revealed no significant difference between athletes from individual and team sports. The study has been criticised for its small sample size ($N = 42$), and that the athletes did not fill in the FSS form straight after their sport activities.

Self-Concept and Psychological Skills. Jackson et al. (2001) explored the link between self-concept, usage of mental skills, and flow. The result showed that if an athlete is more familiar with using psychological skills and has a more positive perception of himself, he is more likely to be in flow. Similarly, Straub (1996) found that mental imagery skills helped to increase the likelihood of college wrestlers experiencing flow.

Confidence. Confidence has been acknowledged as one of the most influential features that affects flow. Researchers (Jackson, 1992; 1995; Kimiecik & Stein, 1992; Koehn, Morris, & Watt, 2013b; Stavrou & Zervas, 2004) showed that confidence is an important factor in helping an athlete to achieve flow. Athletes who have high self-confidence can perceive a challenge in a more positive way and have less concern about other athletes' judgements. It is possible that confidence can assist athletes in approaching the task with less concern and more concentration. At the same time, confident athletes may be more likely to perceive a balance between their skill and the challenge they face, which is a crucial factor in bringing about flow. On the other hand, athletes with less self-confidence may be more concerned with their outlook and performance and, as a consequence, become more anxious and unable to attain flow (Jackson & Roberts, 1992). Koehn, Pearce, and Morris (2013) also found a positive link between confidence and flow state. Confidence is particularly important in helping to improve flow from 5% to 32% when combined with the three domains of achievement, self-regulation, and social climate.

Anxiety. As discussed earlier, when athletes perceive that the challenge they face is greater than their skill level, this normally causes anxiety. The anxiety can have a negative effect on flow and prevent athletes from experiencing flow (Jackson, 1992). Anxiety can cause the athlete to enter into a negative mindset by making an athlete focus on external issues such as competitors or outcome and subsequently prevent or reduce flow (Jackson, 1995; Jackson & Roberts, 1992).

Hypnotic Susceptibility. Grove and Lewis (1996) conducted research on 966 circuit trainers. Using a short flow questionnaire, participants rated their flow experience while moving between exercise stations. Researchers showed there were more changes in flow score among highly hypnotically susceptible people compared with those with low susceptibility.

Performance. The relationship between flow and performance is amongst the most essential psychological concerns to athletes and coaches, especially at the elite level (Nicholls et al., 2005). However, researchers like Csikszentmihalyi (1988) are cautious in entertaining the idea of tying flow and peak performance together. He does not want people to have the impression that flow is only linked with peak performance. It is however notable that Jackson et al. (1998) found some connections between flow and performance. Athletes' skill level can affect their experience of flow.

Enjoyment. According to Csikszentmihalyi's flow model (1990), there is an autotelic dimension to flow, which supports participants in enjoying the experience itself so much, that they just want to repeat it again. Enjoyment is "an optimal psychological state or flow experience that leads to performing an activity for its own sake and is associated with positive feeling states" p. 256 (Kimiecik & Harris, 1996). Similar to emotions, enjoyment has affective, behavioural, and physiological components. Enjoyment is a positive emotion that includes appetitive or approach tendencies, rather than aversion or avoidance tendencies. Enjoyment is demonstrated by distinct facial expressions associated with the contraction of eye muscles. There are also specific physiological responses in the central nervous system (CNS) and peripheral nervous systems associated with enjoyment, which include cerebral asymmetry in Electroencephalography (EEG) activity reflecting more left-hemisphere activity, especially in the anterior temporal region, and autonomic nervous system (ANS) activation. These characteristics of enjoyment indicate that enjoyment is more than a simple positive affective state that is measurable by self-report. Enjoyment also includes distinct facial expressions and physiological reactions in the CNS and ANS and has neuroanatomical and neurobiological bases (Armony & LeDoux, 1997).

Intrinsic Motivation. Csikszentmihalyi's conceptualization of flow was reinforced through the innovative work of DeCharms (1968) and Deci (1971) on intrinsic motivation, whereby, intrinsic motivation and flow have been considered as similar concepts (Csikszentmihalyi & Nakamura, 1989; Csikszentmihalyi & Rathunde, 1993). Intrinsic motivation is significant in sport because it promotes long-term involvement and increased effort. The theoretical perspective is underpinned by the idea that "athletes who are intrinsically motivated should be more capable to experience flow because they could be extremely attracted in the task at hand" (as cite in Csikszentmihalyi, 2014; Jackson et al., 1998). Csikszentmihalyi (2014) also proposed that intrinsic motivation is aligned with the "a person's frequency of engaging in activities for their own sake, and his or her sense of well-being as indicated by level of happiness and by feelings of competence" (p.115) and associated with highly enjoyable experiences. Indeed, flow experience has been associated with peak physical activity performance (Jackson & Csikszentmihalyi, 1999; Kimiecik & Jackson, 2002). Csikszentmihalyi (1975; 1988) proposed that feelings of intrinsic motivation and a heightened sense of self are regularly connected with enjoyment absorption in the task at hand, and when flow occurs in physical activities and sports. Flow has an impact on any activities associated with cognitive and emotional processes. The broader idea is that flow provides an optimal state for athletes, and has been supported through qualitative research (Jackson, 1995; Jackson & Roberts, 1992). Although the nine dimensions' model of Csikszentmihalyi has been consistently reinforced in the literature (e.g., Jackson & Wrigley, 2004; Koehn et al., 2013; 2014; Koehn & Morris, 2014) there is room for more factors to be considered. Some of those factors that may induce flow include intrinsic motivation (Csikszentmihalyi, 1990; Jackson, 1992; 1995), motivation, positive thinking and psychological preparation (Catley & Duda, 1997; Jackson, 1992; 1995; Kimiecik & Jackson, 1992).

Qualitative investigations in sport and exercise have demonstrated that motivation plays an important role in athletes' flow experiences (Jackson, 1992; 1995). Autonomous experiences that reflect intrinsic motivation for exercise are enjoyment, personal challenge, and social association. When intrinsic orientation motives are dominant, participation is likely to be accompanied by a sense of volition and freedom from pressure and therefore long-term commitment is to be expected. Ongoing engagement will be accompanied by positive exercise-related cognitions and affect (Hagger & Chatzisarantis, 2007).

Situational Variables Affecting Flow

Several factors influence the development of flow, such as being motivated to perform well, achieving an ideal level of arousal before performance, having pre-competitive and competitive plans so that the performer feels totally prepared and knows clearly what to do, feeling physically ready/prepared, having an optimal environment and situation, feeling good during performance, having a strong focus (appropriate concentration), feeling confident and positive, engaging in team play and interaction, having previous experience as a competitor and having already experienced flow in the past. Also, uncontrollable events such as unwanted crowd noise / response, or non-optimal conditions could be regarded by athletes as major disruptive factors to flow (Jackson, 1995). Professional athletes often compete in highly prestigious competitions which may cause them to pay a lot more attention to the result, in contrast to amateurs who play their sport mainly for the joy of it. Jackson and Kimiecik (2008) argued that it might be easier for amateur athletes to adjust their sporting experience to maximise the quality of their experience.

Kimiecik and Stein (1992) regard environmental factors and the type of sport as factors that can influence flow during competition. Research undertaken by Russell (2001) and Young (2000) also came to the conclusion that various environmental factors may disrupt an athlete's flow state during competition. Similar to Jackson (1995), Jackman et al. (2015) found that physical readiness, effective preparation, performance assessment, confidence, optimal arousal, focus, and motivation are all possible factors in facilitating, inhibiting, or disrupting flow in jockeys. Furthermore, Jackman et al. introduced three new characteristics that have influences on flow which are only applicable for horse riding jockeys, namely horse demeanour and performance, interaction with owner/trainer, and relationship between horse and jockey. All these three factors can facilitate, inhibit or disrupt flow. They mentioned different conditions for facilitating, inhibiting, and disrupting the occurrence of flow in flat horse racing. Ten professional flat track jockeys were chosen for semi-structured interviews on their experience of flow in horse racing performance. Analysis of content revealed that conditions similar to those which emerged in other studies involving elite athletes were prevalent, based on effective preparation, environmental and situational conditions, experience, physical readiness, trainer/owner interaction, focus, motivation, arousal, confidence, and performance feedback. In addition, they found that environmental and situational conditions had the greatest effect on the disruption of flow, despite some slight impact as a facilitative factor in relation to flow.

Measurement of Flow

The flow experience can be measured both in general, and in sport specifically through three main approaches. These methods include the Experience Sampling Method (ESM), using in-depth interviews, and questionnaires, such as the Flow State Scale-2 (FSS-2), and the Dispositional Flow Scale-2 (DFS-2).

Experience Sampling Method (ESM).

At the beginning of flow research, Csikszentmihalyi used the ESM to come up with the flow model. He saw the need to measure everyday experiences on a regular basis when the people are experiencing their usual environment rather than just to isolating them in a lab setting (Csikszentmihalyi & Larson, 1987). Participants carry a beeper or watch, which is pre-set to a certain timing for the alarm. When the alarm goes off, the participants will fill in a questionnaire about how they feel right at that moment in whatever the circumstance is of their current.

Participants will do this for at least a week before the result is analysed. Data from ESM is useful for analysing patterns and the emotional state of the participants throughout the day. According to Csikszentmihalyi and Larson, ESM is a reliable tool which gives researchers information about the magnitude, duration, and sequence of states. It also shows the correlations among the occurrences of various activities. ESM can be used to evaluate flow in various life circumstances, so it offers some advantages, such as the ability to measure thoughts and feelings, and their effect on a natural condition without too much disruption. According to Cerin, Szabo, and Williams (2001), ESM is an ecologically valid method, however it can potential lead to a false result because of priming effects. To further understand this, Cerin et al. conducted research on the pre-competitive experiences of athletes. Results from the research showed no evidence of the definite article while providing good evidence for ESM's validity. One danger is that researchers need to be aware of when using ESM in a sport setting is due to the potential for the disruption of sport performances. Not all sports are self-paced or intermittent and many sports depend also on the opponent.

In-Depth Interviews.

The qualitative method has been used since the beginning of flow research. Csikszentmihalyi (1975) used qualitative interviews to explore flow in various life settings. Jackson (1992; 1995) used in-depth interviews and inductive content analysis to formulate higher-order factors from participants' transcripts. An advantage of an in-depth interview is that it offers a detailed understanding about flow by accessing the perception of athletes. The structure interview provided a general, emic account of the flow experience in real life contexts. It was an important technique implemented in first delineating dimensions and dynamics of the flow experience. It continues to be the approach of choice in exploratory research (e.g., Reed, Schallert, & Deithloff, 2002) and studies directed toward rich, integrated description (Jackson, 1995; Neumann, 2006; Perry, 1999)

Questionnaires

Flow State Scale-2 (FSS-2). Jackson and Marsh (1996) worked to construct and validate questionnaires that would measure flow to the standards required by qualitative and quantitative methods. They developed a self-report scale, the Flow State Scale (FSS), to formulate possibilities for quantitative analysis of the flow experience. The description of flow they adopted is characterised by nine components: dynamic balance between C-S balance (balance), clear proximal goals (goals), unambiguous feedback (feedback), focused concentration on the present activity (concentration), sense of control over one's actions (control), merging of action and awareness (merging), loss of self-consciousness (self-consciousness), loss of time awareness or time acceleration (time), and autotelic experience (autotelic). These components can be regarded as correlated dimensions of the flow construct that can be traded off in determining the intensity or level of flow. If the level of all the components is at its highest, a person will be in their most intense, complex, and ordered flow state. If some components reach the highest level, whereas, others reach only medium or low levels, the contributions to flow of the different components will trade off in producing a flow state that will be overall less intense, complex, and ordered than the ideal flow state. Jackson and Eklund (2004) suggested in the FSS-2 manual that scores of 108 (the mid-point of the scale) or above reflect that individuals are experiencing a flow like state. However, little research it could have meant there is a lot of research, but it did not find this. Now it is clear that the point just hasn't been tested much.

A revision of the FSS was developed by Jackson and Eklund (2002), which is known as the FSS-2. They refined and validated a standardised questionnaire, the FSS-2, which measures the intensity of flow as a state. This questionnaire focuses on measuring the state part of flow in an event. FSS-2 has 36 items covering nine dimensions of flow. Each dimension is measured by four questions. Participants respond to a 5-point Likert scale with 1 meaning strongly disagree to 5 meaning strongly agree. Each is measured by four items, which are summed to give a score between 4 and 20 for that dimension of flow. The FSS-2 questionnaire has shown good reliability with its alpha range from 0.76 to 0.92 (Jackson & Eklund, 2002). On account of its popularity and reliability, FSS-2 has been translated into various languages (Jackson, 2011; Jackson, Martin, & Eklund, 2008).

Dispositional Flow Scale -2 (DFS-2). This questionnaire focuses on measuring the trait part of flow in participants. It offers information about the frequency with athletes can experience flow. By evaluating participants based on DFS-2, researchers can gain more understanding of the autotelic personality, a factor which may affect how some people find it easier to achieve the flow state than others (Jackson et al., 1998). Hence, it is not measured right after a participant has been involved in an activity, but instead during a period of time before or after. There are 36 items which are divided into nine subscales. Each of the subscales correspond to one of the dimensions described by Jackson (1995). Participants rank the answer based on a 5-point Likert scale with 1 meaning never and 5 meaning always. According to Jackson and Eklund (2002) the internal consistency reliability for the subscales ranged from 0.78 to 0.90.

One challenge with using the FSS-2 and DFS-2 is the time it takes and the number of questions, which may not be very practical in a sport competition setting. Coaches and athletes are less likely to agree to pause their event to answer 36 questions (which can easily take athletes out of their concentration zone). With this concern in mind, Jackson and Kimiecik (2008) introduced the new Short Flow Scales for both FSS-2 and DFS-2. Both of these new versions are named with the word “short” in front of the questionnaire to differentiate them from the long version. Both the short questionnaires have nine questions, with each question relating to one flow dimension. Participants also rank their answer on a Likert scale from 1 to 5 with 1 meaning strongly disagree and 5 meaning strongly agree. According to Jackson and Kimiecik Short FSS-2 and Short DFS-2 both show good reliability while the confirmatory factor analysis for Short DFS-2 is stronger than with Short FSS-2. More studies are required to further support the validity and reliability of these questionnaires. Koehn and Morris (2014) studied the effect of performance context and skill level on the frequency of flow experience in junior tennis players. The study employed a program to examine differences in flow frequency between competition and training sessions and the independent group factor of ranking list and club players. They found that the flow experience of lower-skill athletes revealed similar frequency across performance contexts, with advanced athletes experiencing flow more often during training than competition. Club players’ involvement in both training and competition was based on intrinsic reasons. In addition, professionally ranked players reported intrinsic reasons for training, but a high number of extrinsic reasons for competition. Koehn and Morris found that the ranked players tend to experience increased flow during training and reduced flow during competition, while the club players are more stable across different environments. They also raised an important point which is that “flow dimensions in training are not a strong predictor of flow in competition” (Koehn & Morris, 2014). This means we need to consider environmental factors to a greater extent when evaluating the flow score of an athlete. Other factors that may affect flow include interaction between coach and athletes and between teammates (Kimiecik & Stein, 1992).

There are several challenges with using the questionnaire to measure flow. First, the flow questionnaires are frequently used to measure flow right after athletes finished their games and competition. Thus, their performance outcome might affect how athletes response in the questionnaire. Second, there has been no indication of the minimum score level of the flow questionnaire required for individuals to be in flow. Currently, research using the flow questionnaire worked based on an assumption that the flow state is a continuum, whereas people can only either be in flow or out of flow. Third, the score of each dimension might not be comparable in practice, although they are equal in numerical value. For example, the score of 14 in the autotelic experience dimension might not be similar with a score of 14 in the unambiguous feedback. Thus, Jackson and Marsh (1996) and Kimiecik and Stein (1992) suggested researchers to combine both in-depth interview with questionnaire to have a better understanding of the flow state.

Current Research in Flow and Performance in Sports

Stavrou, Paychountaki, Georgiadis, Karteroliotis, and Zervas (2015) studied flow theory and goal orientation, examining positive experience and determined both the relationship and the difference between flow experience and goal orientation. Out of 272 athletes who participated, there were 160 males and 122 females. They each completed the Task and Ego Orientation Sport Questionnaire (Karteroliotis & Stavrou, 1996) and Flow State Scale -2 (Jackson & Eklund, 2002) after their 30 min competition. Researchers showed the critical factors for achieving flow in competitive sport is athletes' task orientation, feeling a high level of performing, and judging the current competition as challenging. The findings of this study importantly showed that C-S balance did not directly relate to goal orientation.

Recently, consideration of psychological state constructs aligned to flow has occurred in sport psychology. Koehn, Stavrou, Cogley, Morris, Mosek, and Watt (2017) reported the development and validation of parsimonious sport specific version of absorption. The absorption in sport concept has been chiefly reviewed in terms of sport phenomena on a conceptual level without the support of empirical evidence (Jackson, 2000; Privette, 1983). Conceptual perspectives of optimal experience previously identified absorption as one of the communal aspects related to peak performance, peak experience, and flow, with recent research by Swann et al. (2016; 2017) also reinforcing the flow concept connection with flow state, performance and absorption. This outline also emphasises the active nature of the construct, indicative of when athletes are in a flow state, measurement taken during activity clearly reflects the active involvement of athletes in their sport. The measurement of absorption was undertaken through the use of the short form measure of flow (Jackson et al., 2008), assessing the nine dimensions of flow including C-S balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, autotelic experience and a 10-item Core Flow Scales measure, whose items ask whether participants are “totally involved,” “totally focused,” “tuned in,” or “in the zone”. Martin and Jackson (2008) developed the Core Flow Scales (CFS). This short measure comprises 10 items. The aim of the CFS is to assess the core experiential characteristics of the flow experience. The CFS has not been widely used in research to date.

Swann, Crust, Vella’s, Allen, and Keegan (2017) review evaluated existing information and dynamic perspectives of the optimal experience related to sport performance, and the connection of flow state and psychological states that it might occur in the same performance experience. This research presented additional supportive experience of recent studies and increased understanding of the overlapping of the flow experience and psychological state. In addition, researchers were encouraged to re-examine and develop new versions of the FSS and

FSS-2. Swann et al. supported the development of qualitative studies and research investigating measures and methods of modification of flow experience in sport psychology.

The effects of confidence and anxiety on flow state in competition was investigated by Koehn (2013). In one of his landmark publications, Csikszentmihalyi (1975) acknowledged that whilst the state of flow is rare, achieving it results in highly positive experiences in everyday life as well as sport. What boosters these positive effects are athletes and trainers having confidence, whereas it has been found that anxiety can lead to negative associations with flow (Jackson, et al., 1998). The sample for this study consisted of 59 junior tennis players (aged between 11 and 16) of which 35 were male and 24 were female. Participants had been playing in tennis competitions between 1 and 7 years and the training they underwent varied between 1 and 15 hours per week. On average, the majority of athletes (86.4%) had been playing tennis for a minimum of four hours each week but there were 10 juniors who were classified to be of advanced skill level as reflected by their national ranking list of competition position. After a competitive tennis match, participants were asked to complete measures of the Competitive State Anxiety Inventory-2(d) (CSAI-2d) and FSS-2 in a separate room within half an hour of the end of the competition. They retrospectively thought about their performance and provided data on their experience. Researchers showed junior players who had high-confidence when playing, interpreted cognitive anxiety as facilitative compared to the low confidence group who interpreted it as debilitative. In terms of somatic symptoms, the high-confidence group similarly viewed them as facilitative more than the low confidence group of players. Independent samples of tests showed that a significant difference between confidence groups and how cognitive anxiety was interpreted were evident. In the conclusion of the study, Koehn (2013) acknowledged that the use of a more homogenous group of participants in comparison to heterogeneous samples used in other studies, may have been affected the reliability of the performance.

Finally, Koehn, Stavrou, Young, and Morris (2016) studied the applied model of mental imagery use to examine the moderation, mediation effects and flow experience. They assessed the interaction between imagery use and imagery ability in competition, and effect of imagery awareness and motivation on athlete's reflection in optimal experience (Koehn et al., 2016). Athletes were study in sport and exercise science and sport psychology 367 students participated and they aged between 17 and 32 years from team sports including football, soccer, Australian rules football and basketball. The study measured key variables of using imagery ability, imagery use and dispositional flow by the SIQ, SIAQ, and DFS-2. The results showed that imagery ability supported moderate in the relationship between imagery use and flow.

Imagery in Sport

The process of creating and recreating images in the mind is common practice to almost every human being. Imagery is a mental process that is regularly operating in most people (Morris, 2010). In fact, evoking a mental plan for their future action can be either spontaneous or through training and preparation (Weinberg, 2008). Imagery is a very powerful tool for performances enhancement (Munzert, Lorey, & Zentgraf, 2009). Munroe-Chandler and Guerrero (2019) proposed that imagery is reported to improved athletes' self-confidence, self-efficacy, collective efficacy, flow experience, sport skills and attention. Hence, imagery training has become a popular psychological preparation technique for many areas of sport and exercise engagement (e.g., Guillot, Nadrowska, & Collet, 2009), as well as other motor skill domains and occupations such as artistic performances (e.g., Morris et al., 2004), and even in medical surgery (e.g., Sapien & Rogers, 2010).

Imagery has been regularly used as a psychological skill in a sport context to enhance peak performances, which may also support the attainment of flow states (e.g., Pates et al., 2001, 2002). Imagery is mainly used in sport for learning and practising skills, developing tactics and game strategies, previewing and reviewing performances, as well as facilitating recovery from injuries and heavy trainings (Morris et al., 2004). Another application of imagery is to cultivate psychological variables, such as motivation, confidence, and concentration (Morris et al., 2005). Imagery can help athletes to manage their behaviour, and control thoughts and emotions under pressure (Weinberg & Gould, 2014). This powerful technique has been applied frequently in sport, and has captured more attention recently (Morris et al., 2005). Researchers have delved into various aspects of imagery as an efficacious psychological technique to not only discover the underlying mechanisms of imagery, but also to ultimate the effectiveness of imagery delivery in sport and other related fields (Morris et al., 2005). Moreover, imagery positively affect athletes' performance by intervening psychological variables, including the key antecedents of flow (Koehn et al. 2013). Athletes can benefit from imagery by imagining the situations that they previously experienced and even creating images that have never experienced. It also can be improved and applied systematically in variety of contexts.

The broad application of imagery in various fields has resulted in the use of different terms and definitions of imagery. For example, the terms “visualisation”, “visual imagery”, “motor imagery”, “mental rehearsal”, “mental practice”, and “imagery rehearsal” have been often used interchangeably. Moreover, controversies surrounding the uniqueness and qualities of mental imagery within and among the different fields of psychology have made defining imagery more challenging (Morris et al., 2005). Hence, in the following section, firstly, the most frequently used definitions of imagery are presented. Then, to explain the imagery more holistically, the definitions from three different perspectives, including the cognitive psychology perspective, the neuropsychological perspective, and the sport psychology perspective are presented. Imagery is a skill as it can improve with practice.

Definitions of Imagery

The focus of the earliest definitions of imagery was on the identified muscle activations generated while imagining specific movements (Jacobson, 1930; Sackett, 1934). Later on, by reviewing the literature regarding the effects of imagery on performance, Richardson (1969) defined mental imagery as "all those quasi-sensory and quasi-perceptual experiences of which we are self-consciously aware, and which exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts" (pp. 2-3). Richardson's definition has been extensively used and intensively discussed whenever people have referred to imagery processing. Richardson (1983) after analysing a large array of definitions of imagery that had been proposed over the years, concluded that the term is actually used interchangeably to both describe and explain the imaginal experience. Researchers have further proposed more specific terms and definitions focusing on motor imagery. For instance, motor imagery is defined as internal or mental rehearsal of a physical movement or skill without any overt body movement (Crammond, 1997; Jeannerod, 1994). When focusing on mental imagery from the domains of sport psychology and general psychology, Morris et al. (2005) identified two high relevant terms, namely "imagery ability" and "imagery use". McAvinue and Robertson (2008) discussed the difficulty in defining these terms as motor imagery has a highly internal nature. However, they later deduced that motor imagery ability and use can be defined in terms of "imagined movement from the first-person perspective".

Similar to findings from the general and sport psychology perspectives, cognitive psychologists also have provided inconsistent descriptions of mental imagery in regard to defining the contributory processes. Morris et al. (2005) accentuated that the variation in mental imagery definitions is primarily due to the context in which they were being used. For example, Finke (1989) defined mental imagery as related to mentally visualising the experiences that may or may not occur in conjunction with direct sensory stimulation. However, subsequent mental imagery definitions revolve around the dependency of information retrieval on imagined or re-created mental images by the person. The debate concerning the definitions of imagery still exists due to the continued presentation of new findings by researchers that support or challenge previous definitions. Furthermore, those who define imagery should further consider all aspects and explanations, particularly in connection with cognitive development perspectives and conceptual models (e.g., Guillot, Debarnot, Louis, Hoyek, & Collet, 2010; Guillot, Lebon, & Collet, 2010; MacIntyre & Moran, 2010; Weinberg, 2008). Thus, imagery can be described as "an experience that include one if not of the senses and allows individuals to consciously be aware and have the ability to control their thoughts and image when preparing for practice or competition" Munroe-Chandler and Morris (2011, p. 277).

Definitions from Cognitive Psychology

Based on the model of imagery by Paivio's (1985) explanation in connection with the application of imagery in the area of cognitive memory and learning, imagery is an associated process to memory coding, which provides similar information and mediated overt responses, where the situations have not actually been witnessed or experienced physically by the imager. The visual aspect of imagery may not have been sufficiently referred in the abovementioned definition.

> White and Hardy (1998) defined the imagery experience more comprehensively as "an experience that mimics real experience. We can be aware of 'seeing' an image, feeling movements as an image, or experiencing an image of smell, tastes, or sounds without actually experiencing the real thing…It differs from dreams in that we are awake and conscious when we form the image" (p. 389).

The multisensory activation and emotional triggering involved in imagery were accentuated in White and Hardy's definition. Moreover, they differentiated between imagery and dreaming on the basis of individual consciousness whenever the imagery activity was engaged. Previously, other researchers also impressed on the individual conscious awareness as the main distinction between imagery and dreaming or daydreaming (e.g., Murphy & Jowdy, 1992). Perry and Morris (1995), however, argued that similar to imagery, daydreaming also occurred when people were conscious. They suggested that imagery training features a volitional control of the image, which distinguishes it from dreaming states.

Definitions from the Neuropsychological Perspective

Modifying the definition of Morris et al. (2005), Holmes and Calmels (2008), presented a definition to distinguish between imagery and observation learning:

> "Imagery in the context of sport, may be considered as the neural generation or regeneration of parts of a brain representation/neural network involving primarily top-down sensorial, perceptual and affective characteristics, that are primarily under the conscious control of the imager and which may occur in the absence of perceptual afference functionally equivalent to the actual sporting experience" (p. 433).

The emphasis of this definition is to explain the imagery processes that include the neural activities of CNS. Furthermore, Holmes and Calmels extensively examined imagery and modelling techniques according to neuroscientific perspectives. They pointed out that only using an imagery script, may not be enough to activate the emotion-related part of the brain (e.g., anterior insula, amygdala), as much as modelling or observation training can do. This information supports recommendations from other studies that highlight applications of imagery training based on modelling (Ram, Riggs, Skaling, Landers, & McCullagh, 2007; Sakamoto, Muraoka, Mizuguchi, & Kanosue, 2009).

Definitions from Sport Psychology

According to Cumming and Ramsey (2008), a few terms, such as visualisation and mental practice have been used to explain imagery training in the realm of sport. Morris et al. (2005) stated visualisation is commonly used to refer to imagery. They suggested the term visualisation gives the impression that imagery activity is solely visual, whereas people imagine in all six sense modalities. In addition, according to Suinn (1994) most activities related to imagery in sport situations could also be defined as "closing one's eyes and thinking about a motor movement but without any visual or proprioceptive components, all the way to full-blown imaginal rehearsal with auditory, visual, proprioceptive, and emotional elements" (Suinn, 1994, p. 24).

Another popular definition of imagery from the sport psychology perspective is related to psychology procedures that evoke physical characteristics or mental representations without the presence of an actual object or event (Denis, 1985; Solso, 1991). For example, a cricketer generates a mental image of a cricket situation or shot without actually participating in the competition or swinging the bat. Simons (2000) proposed that imagery definitions in sport psychology should represent activities beyond the process of stimulating multiple sensory, object, event representation, and emotion associations. Moreover, Simons suggested that imagery training should also include the process of matching the memory system with the complex information from the actual environment and inducing elements of creativity, although the individual may have never experienced the real situation. For example, very few athletes participate in the Olympic Games, yet, with some creativity, everyone is capable to imagine performing at the Olympics (Morris et al., 2005).

Morris et al. (2005) proposed a definition of imagery related to sport, which was influenced by several elements of Richardson's (1969) widely cited definition:

> "Imagery in the context of sport, may be considered as the creation or re-creation of an experience generated from memorial information, involving quasi-sensorial, quasi-perceptual, and quasi-affective characteristics, that is under the volitional control of the imager, and which may occur in the absence of the real stimulus antecedents normally associated with the actual experience" (p. 19).

Practically, due to the dynamic nature of research, and also individual differences, the controversy still exists regarding a universally accepted definition of imagery. New findings should help researchers to update the existing definitions and identify the individual differences that lead to the uniqueness of each imagery-training program and consequently influence the various personal experiences associated with the imagery process (e.g., Fazel, Morris, Watt, & Maher, 2018; Munroe-Chandler & Guerrero, 2019; Watt, Klep & Morris, 2018).

Theories of Imagery

The effectiveness of imagery to enhance performance in various sports has been widely supported by research (Sapien & Rogers, 2010; Shearer, Holmes, & Mellalieu, 2009; Wei & Luo, 2010). To aid in understanding how imagery works and explaining its underlying processes, scientists have proposed a number of theories. In this section, several theoretical explanations of imagery will be discussed, specifically, psychoneuromuscular theory, symbolic learning theory, bioinformational theory, triple-code theory, the neuropsychological explanation and Models of imagery ability.

Psychoneuromuscular Theory

The Psychoneuromuscular theory (Muscle Memory) was among the earliest explanations of the process underlying the impact of imagery on movement. It was proposed by a researcher who studied muscle activity when people engage with imagery (as cited in Morris et al., 2005). It postulates that imagery of an action innervate the same neuromuscular activity pattern but weaker in magnitude to those used in the actual movement. Carpenter (1894) suggested that the neuromuscular activity in brain during imagining stimulates similar pathway as physically engaging in the activity. For example, intensive activities of creating "walking" images in the mind can cause contractions in relevant muscles, such as the hamstring and quadriceps. By using a basic EMG technique, Jacobson (1930) conducted experiments that required athletes to imagine climbing and arm bending movements. He found greater muscle activation compared to rest in the similar region to actual physical execution. Suinn (1972; 1976) monitored the electrical activity of the downhill skiers' leg muscles while they imagined skiing downhill. He found greater muscular activity when the skiers were imagining skiing through rough snow. He further supported this notion by showing increase EMG activation occurred when skiers were thinking about racing (Suinn, 1984). Jacobsen (1931) and Jowdy and Harris (1990) also reported significant increases in muscular activity during mental imagery. However, other research as suggested otherwise. Slade, Landers, and Martin (2002) found that the activity pattern produced by the muscle during imagery is not identical with when performing.

Furthermore, there is no evidence to support that improved performance is a result of the innervations produced by imagery. Hecker and Kaczor (1988) considered "Psychoneuromuscular theory as a proposal of important aspects of an effective imagery rehearsal, rather than an explanation of the processes involved in improved performance" (p. 364).

Symbolic Learning Theory

Sackett (1934) developed the symbolic learning theory and suggested that imagery may function as a coding system to help people understand and acquire movement patterns. This coding system of movement patterns can create a mental blueprint in the CNS for successfully completing the movement (Amasiatu, 2013; Arvinen-Barrow, Weigand, Thomas, Hemming, & Walley, 2007; Weinberg & Gould, 2007). This theory was based on concepts related to cognitive learning and differs from the explanation of the imagery process triggering electrical muscle activity (Cox, 2002; 2012; Lavallee, Kremer, Moran, & Williams, 2012). Sackett (1934) argued that mental imagery enhances the performance of varied cognitive aspects of tasks through the development of a stronger mental blueprint. According to symbolic learning theory, mental imagery enriches the cognitive information associated with skills, such as movement timing, sequencing, and planning (Guillot et al., 2009). For example, a basketball player can use imagery to rehearse a shooting technique. This will help the athlete to master the technique or correct mistakes and to perform it successfully in competitions, where there is not enough time for thinking.

Bioinformational Theory

The bioinformational theory was proposed by Lang (1977) and was formulated originally as a therapy technique for individuals suffering from phobias and anxiety disorder. Indeed, the theory has been well-supported in the sport psychology literature (Bakker, Boschker, &

Chung, 1996; Slade et al., 2002; Smith & Collins, 2004; Smith, Holmes, Whitemore, & Devonport, 2001; Lavallee et al., 2012; Weinberg & Gould, 2014; Wilson, Smith, Burden & Holmes, 2010). The core component is that when people employ imagery, units of information (termed propositions) regarding objects, relationships and events are stored in the brain through the long-term memory. There are three types of propositions represented in memory, namely stimulus, response, and meaning propositions. Stimulus propositions represent the descriptive referents relating to the external environment and the features of the imagery scene. Response propositions describe the imager's responses to the stimuli in the scene. The response proposition was designed to add physiological activity (Weinberg & Gould, 2007; 2014) as well as emotional changes during imagery. Meaning propositions represent the athlete's interpretation and perceived importance of the image. For example, basketball players might imagine the crowd, the opponent and the basketball court (stimulus proposition). They might feel the excitement, arousal and all the emotions and physiological symptoms associated with the competition such as muscle tension and increased heart rate (response proposition). The outcome of the imagery can vary depending on whether they see the situation as a challenge or a threat, or whether they are feeling anxious or energized (meaning propositions). Although, there is little evidence to support its role in performance enhancement, the bio-informational theory has garnered the most attention (Weinberg & Gould, 2007; 2014).

Triple Code Theory

The triple code theory has been used as a framework for investigating the cognitive process of imagery. Ahsen (1984) proposed a more advanced cognitive-based theory the triple code model (ISM) of imagery. Three important foundations in this theory comprise the image (I), which represents the event, situation, or movement created in the mind; the somatic response (S), which is the neurophysiological response triggered from imagery (e.g., the muscle tension and elevation of heart rate); and the meaning of the image (M), that varies according to every individual's interpretation and how they perceived the imagery content. Ashen (2001) stated that "the images contain not only the visual detail (Image) but also the emotional and physiological components (Soma) and the verbal and interpretive relationship (Meaning)" (p. 8). Researchers have reported that the meaning factor provides more information prior to developing an effective imagery-training program. Morris et al. (2005) developed three essential (Image, Soma, Meaning) components of imagery in this theory that can help further understanding how imagery effect to individual performance. Nonetheless, this information is normally neglected in other imagery models (Kornspan, Overby, & Lerner, 2004). Furthermore, Murphy (2005) found that each athlete gained their experience from years of participation in various competition and training situations. Therefore, the same imagery content is highly likely to affect athletes differently according to their personal experience, perception, and meaning.

The most important aspect acknowledged in triple code theory commonly neglected in imagery models is the meaning element (Ahsen, 1984) which is similar to the meaning propositions explained in bioinformational theory. Revised applied model of imagery use (RAMIUS) For example, a triple jumper who is provided with the imagery content consisting of the atmosphere of the Olympic stadium with the spectators clapping hands while also chanting the athletes' name prior to each jump, could create the psychophysiological responses, such as muscle activation, elevation of breathing rate, and self-confidence. These conditions could enhance athletes' performance, if they have previous experience performing well in a similar situation. Conversely, if athletes have had a poor performance experience, such as higher anxiety when facing similar situations, the same imagery content most probably will not be beneficial. In support of the triple code theory Kornspan et al. (2004) examined novice golfers' pre-performance imagery strategies in golf putting. The golfers mentioned that the previous experience is a crucial factor to the creation of a meaningful imagery experiences, which leads to beneficial imagery training.

Neuropsychological Explanation

One of the most recent explanations for imagery mechanism is the neuropsychological approach also known as the functional equivalence explanation. By using various high technology equipment, researchers accurately monitored and predicted what kind of movement was carried out (Neuper & Pfurtscheller, 2010), what kind of movement was planned in a person's brain (Lee, Marzelli, Jolesz, & Yoo, 2009), and what was the extent of the emotional response involved when a person imagined a specific movement (Kosslyn, Ganis, & Thompson, 2010; Langhinrichsen & Tucker, 1990). Both the imagery process and the execution of a task, to some degree, involve similar neural activities, and share certain representations, neural structures, and mechanisms (Moran, Guillot, MacIntyre, & Collet, 2012). For example, neuro-imaging studies show imagining and executing an action stimulate the same areas of brain such as the posterior, parietal, pre-motor, and supplementary motor cortex (De Lange, Taris, Jansen, Kompier, Houtman, & Bongers, 2010; Munzert et al., 2009). In other words, during imagery the brain sends messages to the muscles that are involved in the physical execution of the imagined task, but a parallel message inhibits muscle action, so the skill is not executed. As the brain has been trained to send messages to the right muscles, it is likely that athletes successfully execute the task in the future. However, the more vivid the image, the more neural overlap between imagery and execution of the given task (Holmes & Collins, 2001).

In conclusion theories had been propounded to address how imagery influences athletes' performance of cognitive and motor tasks. However, there is no empirical support for any of the theories discussed apart from bio-informational theory. In addition, none of the theories considered can adequately explain all the effects attributed to imagery in the context of sport. Therefore, further investigation and development is required as these theories were not designed to be used specifically in the area of sport psychology or linked to the incorporation of imagery as a performance enhancement framework in sport.

Models of Imagery Use

The PETTLEP Model

The "PETTLEP Approach to Motor Imagery: A Functional Equivalence Model for Sport Psychologists" as presented by Holmes and Collins is a model that draws upon broad neuroscientific functional equivalence literature as well as personal experiences of the processes of motor imagery script construction. It is strongly believed that many arguments for the effectiveness of motor imagery can be included within at least one of this model's seven components. One of the most recent theoretical models of imagery in the field of sport psychology is the PETTLEP model that includes Physical, Environment, Task, Timing, Learning, Emotion, and Perspective elements Holmes and Collins (2001). The PETTLEP model has offered guidelines developed by Holmes and Collins (2001) for imagery interventions in sport. The model was originally based on findings from neuroscience and cognitive psychology and centered on the existence of a functional equivalence between imagery and the execution of a task. Clear evidence has emerged stating that the inclusion of PETTLEP imagery is highly effective for the improvement of motor skill performance Holmes and Collins (2001). It has also been found that there is high importance between matching the imagined and the skill-learning environment, a central component of the PETTLEP model (Quinton et al., 2014).

Holmes and Collins' (2001) model includes some practical guidelines to be considered by researchers and practitioners for imagery interventions operationalized through the use of the seven elements of Physical, Environment, Task, Timing, Learning, Emotion, and Perspective (PETTLEP) to create functional equivalence with the task execution. According to PETTLEP model the more the imagery matches the behaviour, the more benefit one can get from it. The Physical element which helps athletes to include the kinesthetic sensations in their imagery relates to experiencing imagery physically simply by wearing game jersey and holding any associated implements such as ball and racquet. The environment that athletes perform imagery in should mimic the performance environment as much as possible. The Environment element in PETTLEP model could be employed by performing imagery in the competition arena (e.g., hockey pitch) when possible or using improvisation (e.g., video, audio, and photographs) to assist the imagery experience. Based on the Task element the content of the imagery should be appropriate to the skill level and individual preferences of the athlete. This will specifically tailor the imagery experience by personalising the content of the imagery.

To promote functional equivalence, imagery of a task should be performed at the same pace as the actual task execution. The task element emphasizes on performing imagery in real-time, rather than slow- or fast-motion. They do later acknowledge that some tasks may be better in slow motion (when learning) or fast (endurance) sports. Holmes and Collins (2001) also encouraged the inclusion of a learning element within their model, meaning that the content of the imagery should be updated as the individual becomes more skilled. Without such updating, the imagery may fail to effectively enhance performance due to not replicating real life. The

Emotion element represents the arousal that athletes experience during task performance. This means that for imagery to be effective, athletes should recreate the same emotional feelings during imagery as they physically performing. Therefore, the imagery content should be individualised and personally meaningful to each athlete. Finally, the Perspective element reflects athletes' viewpoint of the performer during imagery that can be either internal (through the eyes of the performer) or external (seeing oneself performing as if watching on TV). Holmes and Collins suggested using the internal perspective to make imagery as real as possible to the physical performance. However, they also recognize external perspective to be very effective for some form-based skills, such as gymnastics by drawing on the work of Hardy and Callow, (1999). Individual preference in adopting one imagery perspective is important for successful interventions as some athletes just prefer external imagery or find internal imagery difficult. Therefore, it is very crucial to accommodate the imagery perspective for which the athlete feels most comfortable.

There is considerable empirical support for implementing PETTLEP elements into imagery to ensure its effectiveness on performance improvement (e.g., Smith, Wright, Allsopp, & Westhead, 2007; Smith, Wright, & Cantwell, 2008; for a recent review, see Wakefield, Smith, Moran, & Holmese, 2013). It can be argued that the more elements that are included in the imagery the greater benefit the imagery would have to the athlete as it closely reflects the real-life situation. While some researchers have suggested that omitting certain elements may compromise performance facilitation (Ramsey, Cumming, Edwards, Williams, & Brunning, 2010), introducing all seven components at one time may be impractical in some situations and create overload for the athlete (Wakefield & Smith, 2012). Therefore, it might be difficult for some athletes to absorb all the information given to them regarding the seven elements from the beginning of the intervention. This can be relevant to those who has not experienced systematic imagery before. One way to limit the possibility of overloading athletes is to introduce elements progressively (Williams, Cooley, & Cumming, 2013). For example, introducing the physical, environment, and task elements initially and adding as another layer, and so forth. A similar layering technique of stimulus and response propositions has already been shown to be effective for improving imagery ability and golf putting performance in adults with relatively low imagery ability (Fazel et al., 2018; Williams et al., 2013).

The Applied Model of Imagery Use

Martin, Moritz, and Hall (1999) proposed one of the most influential and established models of imagery to date. This is the Applied Model of Imagery Use in Sport (AMIUS). It is based on the common idea that in a given situation, individuals should use the optimal function of imagery for achieving their desired outcomes. The AMIUS is one of the most important frameworks examining imagery effectiveness in relation to imagery use and ability (Guerrero & Munroe-Chandler, 2017). AMIUS was developed using the theory of the triple code and the bioinformational theory, by the imagery concept that included cognitive and motivational functions (Horn, 2008). Paivio (1985) described the conceptual framework of imagery use in relation to the distinct functions cognitive and motivational, effective between general and specific levels. The imagery functions considered five types of imagery CS, CG, MS, MG-A, and MG-M. The applied model of imagery use provides an overview detailing that different types of imagery will be applied by athletes for different athletic goals and that individuals use imagery to achieve different cognitive, behavioural and affective changes, with imagery content being a key determinant of these changes (Horn, 2008). Munroe et al. (2000) also proposed on the basis of existing theoretical and empirical work that the imagery use of athletes will typically focus on objectives such as skill acquisition, strategy development, goals, arousal regulation, and skill mastery. Furthermore, Cumming and Williams (2013) proposed that the personal meaning associated with a particular image is essential for determining what content is most appropriate to facilitate a particular function. The applied model that imagery will be more effective when it is personalized and meaningful to athletes.

Paivio (1985) studied functional analysis of imagery in relation to behavior mediation. He proposed an imagery model in which four categories of imagery use are derived from combinations of the dimensions of cognitive and motivational processing relationships and the dimension of general and specific behavioral goal achievement. The dimensions are distinguishable based on image content. Hall et al. (1998) identified a fifth dimension during development of the Sport Imagery Questionnaire (SIQ). As an outcome of their extensive involvement in the field of sport and movement imagery, Hall and colleagues have provided sport-oriented descriptions of Paivio's (1985) dimensional classifications (Hall, 1998; 2001; Hall, et al., 1998; Martin, Moritz, & Hall, 1999). Martin et al. (1999) stated that the basis for the model centered on the type of imagery used by the athlete (i.e., the function or purpose that imagery is serving) as a determinant of cognitive, affective, and behavioral outcome" (p. 249). Consequently, the model initially comprised four components representative of this description of the type of imagery used (e.g., MG-A, CS), outcome of imagery uses (e.g., modifying cognitions, strategy rehearsal), imagery rehearsal, imagery ability, and the sport situation (e.g., training, competition). Martin et al. (1999) summarized and extended the original four Paivio categories into five classes of imagery use. There are (a) cognitive general (CG) imagery related to competitive strategies (b) cognitive specific (CS) imagery directed toward skill development or production (c) motivational general arousal (MG-A) imagery related to arousal, relaxation, and competitive anxiety (d) motivational general mastery (MG-M) imagery representative of effective coping and confidence in challenging situations and (e) motivational specific (MS) imagery that represents specific goals and goal oriented behavior.

Imagery Ability

Imagery ability is a reflection of one's capacity for creating, recreating and controlling images. Munroe-Chandler and Gammage (2005) stated that imagery ability is a key moderator related to the imagery-outcome. Individuals' imagery ability varies due to a range of factors, such as their maturity (Cumming & Williams, 2012). It is recognised as a multidimensional skill and can be improved through rehearsing (Williams et al., 2013). The two commonly discussed dimensions of imagery ability in literature are those of vividness and controllability (Morris et al., 2005). Moran (1993) described vividness of an image, as "its clarity and sharpness or sensory richness" and controllability as the "ease of accuracy with which an image can be transformed or manipulated in one's mind" (p.158). Duration is the length that one can maintain an image clearly in the mind once it has been generated (Denis, 1985). The dimension of ease of generation represents the ease an individual is able to evoke an image (Morris et al., 2005). The speed of formation of an image is a dimension that warrants investigation in determining the status of imagery skills. Research and analytic discussion of the imagery ability process has been previously considered to have not been matched with tools to accurately assess this cognitive attribute (Watt et al., 2004).

In their discussion, Cumming and Eaves (2018) presented four processes or dimensions for imagery ability, namely image generation (Morris et al., 2005), image inspection, image transformation (Kosslyn, Behrmann, & Jeannerod, 1995; Kosslyn, Thompson, & Ganis, 2006), and image maintenance (Morris et al., 2005). Image generation is the process of creating an image in the absence of perceptual stimuli while only relying on stored information in long-term memory or retaining sensory information (Kosslyn et al., 1995). Image inspection is extracting information from an image by scanning the whole image or its parts and interpreting its patterns (Kosslyn et al., 2006). Image transformation means altering the features of an image, either the content or characteristics.

Cumming and Williams (2012) referred to imagery content as what individuals' image (e.g., skills, goals, strategies), whereas imagery characteristics are how individuals experience the content (e.g., angle, modality, perspective). The authors identified five key elements for characteristics involved in the imagery process. The first of these characteristics is modality, which has been described as the senses used in imagery, including, auditory, visual, tactile, olfactory and kinaesthetic. Perspective, which is the visual perspective of either first person (internal) or third person (external). Angle, the other identified by Cumming and Williams (2012), that is the view from the external perspective whilst imaging, and includes, above, behind, front or side. Agency, that is the author or the agent of the behaviour being imagined, (e.g. self or another person). Deliberation, which is the degree to which the imagery process is deliberate or spontaneous (e.g. has it been triggered).

Individual's ability in imagery influences the outcome of the imagery (Martin et al., 1999). Individuals vary in proficiency to generate and control images and generally imagery is more effective for individuals with higher imagery ability (e.g., Robin, et al., 2007). Therefore, it is crucial to measure individuals' imagery ability to make sure they are capable of imagining what the researcher, coach, or psychologists is requesting.

Measuring Imagery in Sport

Imagery Ability Measurement

Measures of imagery ability have been used for many years. Imagery is not directly observable, which means that measures must rely on self-report or must require the imager to undertake a mental manipulation task which can only be accomplished by using imagery. In the latter type of imagery measure, how fast one can correctly complete a task and up to what level of task complexity is the criterion for how well people can imagine

Finding a valid and reliable method of measuring imagery ability has been always a challenge for researchers due to its cognitive nature (Lang, 1977). Researchers have applied both subjective and objective methods to measure imagery ability. Information regarding explicit imagery experiences have been collected through subjective methods such as interviews, questionnaires, or other self-report methods, whereas information regarding implicit imagery experiences have been gathered through objective methods like behavioral, physiological, or neural measures (Guillot et al., 2010; MacIntyre & Moran, 2010; McAvinue & Robertson, 2008). Subjective testing, questionnaires and self-report measures, are more commonly used techniques, which are based on individual’s subjective experience. These tests usually include 5- or 7-point differently formatted Likert scales (Vealey & Walter, 1993).

Hall and Pongrac (1983) developed the Movement Imagery Questionnaire (MIQ) to examine visual and kinaesthetic imagery of simple movements, which individuals actually perform before they imagine doing them. Betts (1909) developed a measure, the Questionnaire on Mental Imagery (QMI) of imagery across all the sense modalities. Other tests that have been developed mainly followed Betts' lead by measuring the vividness of mental imagery. Watt, Morris, and Andersen (2004) developed a measure of imagery that was designed specifically for sport, the Sport Imagery Ability Measure (SIAM). The design of the SIAM reflects the basis of all the measures listed to this point, namely that they measure some type of generational or sensorial aspect of imagery ability. Hall, Mack, Paivio, and Hausenblas (1998) addressed a different aspect of imagery in the Sport Imagery Questionnaire (SIQ). The SIQ focuses on what types of imagery people use (frequency), rather than how well they use imagery (ability). All these measures of imagery related to movement and sport are described briefly here.

Some of the subjective imagery ability measures that have been used in imagery studies are the Questionnaire upon Mental Imagery (QMI, Betts, 1909), the Shortened form of the Questionnaire on Mental Imagery (SQMI, Sheehan, 1967), The Vividness of Visual Imagery Questionnaire (VVIQ, Marks,1973), the Vividness of Movement Imagery Questionnaire (VMIQ, Isaac, Marks & Russell, 1986), the Movement Imagery Questionnaire (MIQ, Hall & Pongrac, 1983), the Revised versions of the Movement Imagery Questionnaire (MIQ-R, Hall & Martin, 1997), the most recent MIQ (MIQ3) to the imagery ability questionnaires, Kinesthetic and Visual Imagery Questionnaire (KVIQ, Malouin et al., 2007), the Sport Imagery Ability Measure (SIAM, Watt et al., 2004; Watt et al., 2018), Motivational Imagery Ability Measure for Sport (MIAMS, Gregg & Hall, 2006), the Vividness of Movement Imagery Questionnaire-2 (VMIQ-2, Roberts, Callow, Hardy, Markland & Bringer, 2008), and the Sport Imagery Ability Questionnaire (SIAQ, Williams & Cumming, 2011). Each imagery ability measure was designed and developed to capture specific features of imagery abilities in various fields (Di Gruttola & Sebastiani, 2017). Therefore, it is vital to choose an appropriate measure based on the design of the study and what dimension and process needs to be measured. For example, to measure the dimensions of generation or the vividness, the MIQ-3 (Williams et al., 2013) or Vividness of MIQ-2 (Roberts, Callow, Hardy, Markland, & Bringer, 2008) would likely be the most appropriate tool to use. By contrast, if interested in a variety of both cognitive and motivational sport specific content, the SIAQ may be more appropriate.

The Sport Imagery Ability Measure (SIAM; Watt et al., 2004) has been acknowledged as a suitable tool in the field of sport to provide a multimodal and multidimensional measure of sport imagery ability. The questionnaire was developed to cover all the important aspects of imagery that were missing in existing questionnaires. This measure included five dimensions, which were vividness, control, duration, ease and speed of generation of images as well as six sense modalities, namely visual, auditory, kinaesthetic, tactile, gustatory and olfactory. In addition, the experience of emotions associated with imagery was also included in this measure.

Watt, Klep, and Morris, (2018) conducted a psychometric analysis of the Sport Imagery Ability Measure (SIAM). They proposed that effective and reliable imagery training measures require multi-modal and multi-sensory assessment to ensure all facets of the imagery process can be incorporated with future interventions. Participants included 625 athletes from school, university and sport clubs across four levels of competitions. The results showed a difference in imagery ability between athletes categorised within age, gender, skill level and sport competition cohorts. The findings indicated that athletes at higher levels of competition were reporting higher scores for imagery ability than lower level athletes. In addition, the results reinforced the efficacy of the SIAM as a reliable and valid instrument for measuring imagery ability of athletes.

In sum, although each of the imagery ability measures are suitable, researchers should use a tool that is more appropriate depending on the purpose of the imagery ability assessment.

Further examination of individual difference in imagery ability could be achieved by assessing imagery ability based on types of sports and competition level.

Imagery Research in Sport

Imagery remains one of the most extensively researched topics in the field of sport psychology (e.g., Holmes and Collins, 2001; Morris et al., 2005; Munroe-Chandler & Morris, 2011; Smith & Wright, 2008; Munroe-Chandler & Guerrero, 2017; 2019). As more research has emerged over the past couple of decades, there has been an increased understanding of how imagery works and when and how it should be applied to achieve the most successful outcomes (Wakefield & Smith, 2009). In this section I will review the literature of imagery studies in different fields

The sporting environment has long been known for being capable of evoking a stress response by having many demands on competing athletes (Jones, 1995). Whether the individuals assess the threat to be a challenge or threat however provides compelling evidence as to why some athletes succeed in performance situations compared to those who do not perform as well (Williams et al., 2010). Williams, Cumming and Balanos (2010) investigated the use of imagery to manipulate challenge and threat appraisal states in athletes. According to Williams et al. the Theory of Challenge and Threat States in Athletes (TCTSA) explains three key things: why athletes appraise certain encounters as challenge or threat, how they respond psychologically and physiologically to these states, and finally, how the challenge or threat affects their subsequent sports performance. Participants in this study were 10 male and 10 female competitive athletes (representing 9 different sports) with a mean age of 20 years old. For each participant, three personalised imagery scripts were developed based on content that was specifically tailored for the athletes. Each individual was asked to recall a memory of a competitive sporting experience for their imagery script and stimulus propositions to be based on. The Immediate Anxiety Measurement Scale was the tool used to assess the anxiety symptoms and level of self-confidence that participants possessed after being shown each imagery scenario in the study. Results of this study showed that the variations in physiological responses that athletes experienced was not due to personal differences in their abilities to image scripts as previously suggested. Additionally, much to the researcher's interest, it was found that all three developed scripts (challenge, threat and neutral) were all perceived as being as meaningful and emotive as one another. It was previously not thought that the neutral script would achieve the same level of meaningfulness to the participants as the other two scripts did. However, in support of the original hypothesis of the study, the challenge and threat scripts resulted in an increase in anxiety intensity than the neutral script. Furthermore, the threat script was particularly found to evoke the highest levels of anxiety amongst participants. Upon reflection, the athletes reported that the threat script was perceived to be the least helpful when it came to their sporting performance, and conversely found that the challenge script was the most helpful. However, imagery facilitated interpretations of responses resulting in more adaptive coping strategies and decreased athlete's anxiety.

The mediational effects of using imagery in sport were examined by Short, Tenute and Feltz (2005). One of the many important psychological states that affects performance in sport is self-efficacy. As Bandura (1977) articulates, self-efficacy theory posits that one's confidence in their ability to perform a particular task or given behaviour is strongly linked to their actual behaviour to complete that task or behaviour. Short et al. (2005) recruited 74 female athletes who play competitively in a number of sports (volleyball, softball, tennis, basketball, hockey and soccer) and ranged in age from 18-23 years old were selected to participate in the study. The Sport Imagery Questionnaire (Hall, Mack, Paivio, and Hausenblas,1998) which consists of 30 items and five subscales as used as the primary tool for data collection in this study by Short et al. (2005). When collated, the results of the questionnaires showed that overall, athletes were most confident in their ability to use MG imagery and least confident in their ability to use MS imagery. Furthermore, it was found that the results supported the hypothesis of the study, which stated that the more efficacious athletes were in their ability to use imagery, the more frequently they used it.

Hall et al. (2009) explored both imagery use and observational learning use and how these variables are related to sport confidence. The role of mental skills when it comes to successful competitive sporting performance has been largely examined, so much so it has been said that these skills are the distinguishing factor between athletes who are accomplished and athletes who aren't as much so (Hall et al., 2009). Due to this benefit, it has been largely encouraged that athletes frequently practice their mental skills, however this advice has not always been heeded by athletes. Reasons for this including athletes lacking the motivation required in order to exert the necessary effort for engaging with mental skills in their own time; athletes carrying a false sense of belief that mental skills are only useful when in competition; it has even been suggested that athletes may be using mental skills for different reasons when comparing practice and competition, providing reason for why mental skills are perceived to be neglected. The main aim of the study by Hall et al. (2009) was to compare the use of imagery and observational learning by athletes in both practice and competition settings. It was predicted by the researchers that the motivational functions of imagery would be more dominant in competition than practice, and vice versa for the cognitive functions. However, the results contradict this theory as these patterns of imagery use not found. Aside from imagery, the athletes reported employing all of the functions of imagery more in competition than practice. Whilst both imagery and observational learning were found to influence confidence in sport, imagery proved to be of more importance in competition than observational learning.

Video modelling has become a preferred method of delivering imagery training compared to the traditional method of using a written imagery script (Seif-Barghi, Kordi, Memari, Mansournia, & Jalali-Ghomi, 2012). Imagery training combined with video modelling is practical, especially for individuals who have some difficulties practising imagery due to lack of experience in specific events (e.g., Olympics, Tour de France) or limited sports and imagery skills (Weinberg, 2008). The video modelling method is implemented by presenting the athlete with a video of a model performing a correct action to be imagined. For skilled athletes, self-modelling is possible, where athletes watch a video of themselves performing the skill to a high level. The use of a modelling video to practise imagery indicates that a device is needed to view the video footage. Currently, inventions using advanced technology devices have made daily activities more efficient in many areas. For example, telecommunications and audio-visual devices, namely the mobile telephone, DVD players, laptop computers and iPod Touch, have been equipped with multi-purpose functions, and they are cost-effective, user-friendly and have high mobility. Thus, it seems likely that there is potential for using the new technological devices in the process of delivering imagery training that includes video modelling.

Khan (2014) investigated the effectiveness of portable devices (MP4) compared to stationary devices (DVD) in delivering imagery and video modelling to netball players. Forty-five female netball players were recruited to examine the effects on imagery adherence, netball shooting performance, self-efficacy for netball shooting, and personal experience of using the device and expert modelling video. When the results were obtained through personal interviews, it was discovered that all participants in the MP4 conditions reported that the MP4 was a useful device for enhancing the participants' ability to practise the interventions at any time and place. Training routines varied among participants and they were influenced by their personal life and free time activities. Based on these findings, the video modelling programme in this study should have increased athletes' flow experience and performance because it has been proven to be a useful device which can influence training routines. In addition to this, imagery training combined with video modelling has been deemed to be highly practical, especially for individuals who have some difficulties with practising imagery due to lack of experience in specific events or limited sports and imagery skills (Weinberg, 2008). This video modelling method was implemented by presenting the athletes with a video of a model performing a correct action to be imagined. Therefore, the use of portable devices to practise imagery at a sport arena should be particularly beneficial. Furthermore, the devices' portability function has the potential to enhance the effectiveness of the imagery intervention as athletes can employ imagery at almost any time, in any location, and in any situation. The portable device would appear to represent a beneficial enhancement tool for delivering imagery because specific imagery content based on an individual athlete's requirements can be implemented with this delivery method (Morris et al., 2005).

Imagery and Sport Performance

Smith et al. (2001) studied the effect of theoretically-based imagery scripts on field hockey performance. The relevance of bio-informational theory and stimulus and response propositions derived from mainstream psychology has been of pertinent interest to sport psychologists over the years, and in this study, Smith et al. (2001) related it to their own research. Over a period of seven weeks, the participants in the imagery groups (nine in each) were required to image performing hockey penalty flicks three times each week. Control participants on the other hand were asked to not perform any imagery tasks and did not undergo any physical activity during the length of the study. Results showed that the mean scores of penalty flicks of the stimulus and response imagery groups improved significantly by 47.1% and 31.1% respectively. In contrast, participants in the control group only improved by 0.5%, where only three participants showed an improved performance. All participants in the imagery groups improved their performance. These results provide strong evidence backing the effectiveness of imagery as a way of enhancing the specific sport skills such as performing the hockey penalty flick in novice players.

Internal and external imagery use in terms of the effect on performance and training variables was the focus of an investigation by Spittle (2001). Three separate studies were carried out in order to assess this in several ways. In this study participants were instructed to imagine performing eight common sports skills in a random order. Four of these were to be open skills and other four were to be closed skills. Following imagining each individual skill, participants completed a sequence of steps including Retrospective Verbalisation (RV) and Rating Scales (RS). The results of this study revealed that as a whole, participants experienced internal imagery more often than external imagery. However, it was interestingly noted that internal imagery occurred less often when imaging closed sports skills compared to open skills.

In another study by Spittle examining a specifically chosen open skill (table tennis) and closed skill (darts), participants completed the Imagery Use Questionnaire, retrospective verbalisation and rating scales Spittle (2001). He gathered the scores from the combined pre-tests and assigned the participants to training groups. Those who scored lower on internal imagery were required to complete four 30-minute internal imagery training sessions whilst those who scored low on external imagery completed the opposite training. The results showed that the participants who underwent internal training significantly increased their use of internal imagery when performing both the open and closed skill. A high correlation was found between the retrospective verbalisation and rating scales.

In his last study very similarly designed to previous study, he used the IUQ, RV and RS again for measurement and the participants were placed into is-matched groups based on their pre-test outcomes. However, in addition to the two groups (one internal and one external) another 10 participants were assigned to be in a control group, making a total of three conditions. The internal and the external training groups participated in two 30-minute sessions which were divided into generic skills and specific session on the chosen skills. Data presented confirmed that there was a strong correlation between the two sets of items. As a whole over the three studies, participants reported that their use of external imagery was greater when imaging open skills as opposed to closed ones.

Imagery studies in relation to sport performance have also focused on pairing complementary activities with imagery training. Kuan (2014) completed three linked studies, whereby the aim of the research was to investigate and examine the role of music during imagery on subsequent sports performance using 12 skilled shooters. Specifically, relaxing and arousing music were selected as the genres of focus in this research. The study was designed to act as the initial investigation into what effects music has on participants' subjective psychological perception of their level of arousal when performing imagery of a selected sport task. Participants were provided with a list of 90 pre-selected classical music excerpts and were asked to select three Unfamiliar Relaxing, Music and three Unfamiliar, and Arousing Music. The pieces of music selected had to be those that were unfamiliar to them. This was done in order to minimise extraneous variables such as past associations with the music that may influence the end results. A third set of music that was to be selected were three excerpts of familiar arousing music. Participants were then asked to perform shooting imagery whilst listening to the sets of three preselected music excerpts of each type in a random order. Overall it was discovered that Unfamiliar Arousing Music was the most arousing music when shooters performed imagery. It was concluded from the findings his research that relaxation is strongly beneficial for the facilitation of imagery.

Taylor and Shaw (2002) examined the extent of the effects of positive and negative outcome imagery on golf-putting performance. As defined by Shaw and Goodfellow (1997), outcome imagery is the imagery of what takes place immediately after an action is completed, it does not focus on the action itself. A second aim to the study was to examine how outcome imagery affects self-confidence in golf-players. Participants were performed a golf-putting task in three imagery conditions: a positive outcome imagery condition, a negative outcome imagery condition and a no-imagery control condition. The results were generated from an analysis of putting errors and level of confidence of the skilled and unskilled participants in each of the imagery conditions. It was found that when in the negative imagery condition, participants in both groups performed significantly worse than when compared to the other conditions. Unskilled golf players were also found to perform a high number of putting errors than skilled players in this condition. This supported the researchers' initial hypothesis, however there were interesting results from the data collected from the other imagery conditions. Both skilled and unskilled players were found to have the same level of performance in both the positive and control imagery conditions. This provided evidence that reinforces that imaging a negative outcome may have more power in damaging player performance. Scripts connected to imagery training should focus on positive imagery to effectively facilitate performance.

The PETTLEP model has offered seven elements to be considered when developing imagery interventions in sport (Holmes & Collins, 2001). Whilst studies in the past have demonstrated the powerful effects of PETTLEP imagery on motor performance, Wakefield and Smith (2009), claim that it is still unclear as to what amount of PETTLEP imagery is necessary in order to produce optimal sport performance results. Hence, Wakefield and Smith (2009) designed a study that would examine the effects of PETTLEP imagery in differing frequencies on netball shooting performance. For four weeks, participants performed their intervention, with each session comprising of imaged netball shots at the target, four from each of the five different locations that were specified by the researchers. The findings showed that there was no difference in visual and kinaesthetic imagery ability scores between groups. Whilst a majority of participants in the imagery groups reported imagery had been beneficial in aiding them in the shooting task, the three-week group reported the most positive thoughts about its usefulness.

Quinton et al. (2014) used a PETTLEP imagery intervention with young athletes. The aim was to assess the effects of PETTLEP intervention over 5-week on children, in terms of movement imagery ability as well as performance on a specific soccer task. Participants age were 9.72 years old and randomly allocated into either a PETTLEP imagery intervention group or a nutritional control group. The authors implemented a layering approach of the PETTLEP elements, where each component was gradually introduced to the children. This methodology was based on previous research such as that by Smith et al. (2007) who found that it may be overwhelming and impractical to include all seven elements at the very beginning of an intervention. Based on the complexity of each component, the researchers started by incorporating the component of ‘Environment’ and then proceeded to layer on the remainder of the PETTLEP model throughout the study as applicable. The results of the study showed no significant improvement in any of the conditions’ performance highlighting the importance of performers’ age and imagery type that needed to be taken into account in order for the imagery intervention to be more effective.

The effects of PETTLEP-based imagery in comparison to traditional imagery intervention methods were examined by Smith et al. (2010). They claimed that the difference between traditional imagery training and PETTLEP-based imagery is that the latter aims to produce the most realistic imagery experience achievable through focusing on minor details (e.g., the clothing athletes wear, the competitive environment). Two different studies were conducted in order to compare their effectiveness to one another. The first study involved the selection of 48 varsity hockey players and their placement into four imagery groups: “clothing” imagery, “sport-specific” imagery, “traditional” imagery, and a control group. Over the course of six weeks the participants in the first three group imaged their performance of a penalty flick daily whilst the control group only read hockey-related literature. Unsurprisingly to the researchers, the “sport-specific” group, who wore their hockey uniforms and stood on their team’s hockey pitch when the shots, outperformed the rest of the groups, with the control group showing the least improvement. The second study conducted involved 40 junior female gymnasts, aged between 7-14 years old, and assigned to one of four groups: stimulus imagery group, PETTLEP imagery group, physical practice group, and control group. The task was that each gymnast performed a full turning straight jump on the beam. During the study, their attempts were judged by a qualified national British gymnastics coach, who placed the jumps on a scale of 1-10 according to standard British gymnastics criteria. Similar to study 1, the results from this intervention revealed that all three of the imagery or practice groups had showed clear improvement between the pre and post-test. The control group actually showed a decline in their performance. The researchers concluded that the PETTLEP-based intervention had the greatest impact on the gymnasts’ performance when compared to stimulus-based interventions that were performed in a non-sport specific environment and did not require the participants to wear their uniforms. Furthermore, it was revealed that the improvement of those in the PETTLEP-based imagery group was very similar to that of the group who only completed physical practice, therefore indicating that in this case, imagery was as effective as the physical performance of the task.

Hidayat (2011) developed a goal setting and mental imagery intervention to support badminton motor skill learning. All participants were beginner players were randomly divided into four experimental groups and one control group. The methodology and techniques used in this study included a badminton motor skills test, questionnaires, interviews and focus group discussions. All four experimental groups required participants to use a different mixture of shifting goals, mental imagery training and process goals. Thus, the experimental groups are as follows; the first experimental group combined shifting goals with mental imagery training; the second group combined process goals with mental imagery training; the third group combined shifting goals with non-mental imagery training; and the fourth group combined process goals with non-mental imagery training. The control group were to perform under none of these conditions. Every group conducted motor skill training of high service and defensive clear strokes in separate badminton courts. The results were showed no significant interaction between goal setting and mental imagery training when looking at the data obtained from the study.

Imagery and Basketball

This section presents an overview of research on imagery interventions and basketball performance. Specific evidence of the efficacy of imagery interventions on shooting performance that are aligned with the current goals of the research in this thesis are considered in greater detail.

According to Lerner, Ostrow, Yura and Etzel (1996) imagery has the ability to facilitate the acquisition of a skill. In particular, one sport has received substantial attention when it comes to examining the effects of imagery is basketball. Lerner et al. investigated the effects of goal-setting and imagery training. Imagery and goal setting interventions were implemented to ascertain how these could influence on the free-throw shooting performance of female collegiate basketball players. Goal-setting theory is largely based on the assumption that the conscious goals that individuals strive toward on a task directly regulates task performance. The results revealed participants increased their mean on free-throw shooting performance in the specific goals intervention and one participant in the goal-setting and imagery intervention. However, the other three participants mean free-throw shooting performance in the imagery program decreased.

Carboni, Burke, Joyner, Hardy and Blom (2002) examined the influence of imagery on free throw shooting performance and concentration style of intercollegiate basketball players. Specifically, the effect of brief imagery scripts on players' concentration scores on the Basketball Concentration Survey (Bergandi, Shyrock, & Titus, 1990), self-efficacy, and their ability to shoot free throws were analysed. The participants in this study were six basketball players from university and played in Division I. The mean age of the participants was 20.3 years old, and their average playing experience was 10.3 years, as their experience ranged from 3 to 18 years. A single-subject design was the primary methodology for this investigation, as it allowed the researchers to analyse individual changes in performance as opposed to being limited to only observing group variations in performance. After they were given a warm up, each player was asked to estimate how many of the 50 free throws they would be able to shoot. In the initial session, participants were instructed to achieve a relaxed state of mind and then to visualise themselves shooting 10 free throws accurately. The remainder of the study required each basketball player to undergo a maximum of a five-minute sessions of imagery prior to their free throw shooting. In conclusion, it was found that basketball concentration survey scores showed no consistent increase or decrease among the participants. Additionally, external factors such as pressure and stress were attributed as a possibility for some of the decreases in free throwing scores. Out of the six players, five of them rated that they believed the imagery was useful for their performance and stated that they would continue to use the imagery after the conclusion of the intervention.

The impact of a mental training program as an intervention to advance the shooting performance of basketball juniors was the focus of research conducted by Shalaby (2010). This study takes into account the fact that there are a diverse range of motor skills in basketball, all of which require differing levels of mental work. One of the vital types of mental work that takes place is mental training, which Shalaby argues is a very important part of motor training. In this paper, mental training is defined as an "imaginative mental retrieval" of content without the use of scenes. It is the repetition of motor skill perception that is often used alongside a coaching regime, however, like imagery it is not a replacement for physical training. The hypothesis of this study examined the impact of a mental training program to increase shooting performance. Thirty junior basketball players, all under the age of 16 years old, were randomly placed into either an experimental or control group. The experimental group took part in a mental training program that spanned eight weeks, this included five blocks of 15 to 30-minute training each week. Researchers showed there were no significant statistical differences between the results of the pre and post-tests for the control group. The experimental group on the other hand showed a statistical difference for several variables including relaxation, spatial imagination and increased free throw shooting performance. These findings matched the researcher's hypothesis and provided evidence of the benefits of a regularly implemented training program in terms of assisting the players with their ability to relax, which may also support an improvement in their overall performance.

Vaez Mousavi and Rostami (2009) examined the effects of cognitive and motivational imagery on acquisition, retention, transfer and performance of the basketball free throw. One of the strengths of this study was that one could argue that its validity is quite high due to the fact that a large sample size was used. The 78 female students with no prior background in basketball training or competitions were asked to complete a motor imagery ability questionnaire, a sport imagery questionnaire and a free throw shooting pre-test at the beginning of the intervention. The study determined in which of three groups the participants would be placed. The first group was the cognitive imagery group, where they were tasked with imagining the details of the skill as well performing physical practice. Those in the motivational imagery group were to imagine the excitement of a successful performance of the skill while physically practicing, whilst the control group only performed the skill physically. Each group was engaged in 18 sessions of basketball free throw shooting. Researchers showed that although the control group showed the greatest improvement in terms of the acquisition of the basketball skill, they failed to perform well in the retention and transfer tests when compared to the other two groups. Overall, the cognitive imagery group outperformed the rest, the similar finding results supporting previous study (e.g., Cumming & Ste-Marie, 2001; Murphy, Woolfolk, & Budney, 1998) reporting that mental imagery can assist individuals to perform movements accurately during early stages in skill development.

A study was devised by Guillot et al. (2009) in order to investigate the effect of motor imagery on the learning of basketball tactical strategies. They defined motor imagery as a state in which an action is mentally stimulated but without any corresponding body movement. It is a technique that has been referred to as a “multi-sensorial experience” because the images used can include tactile, visual, auditory and kinaesthetic elements (Guillot et al., 2009). Previous studies has found that motor imagery is actually more beneficial for closed rather than open skills, in other words, skills that take place in a monitored environment and do not have the influence of an opponent (e.g., Denis, 1985; Spittle & Morris, 2007). Before the commencement of the study, 10 female national level players were pre-tested for three tactical movement strategies relating to basketball. During the six-week intervention period, the first strategy was mentally and physically practiced twice a week, the second strategy was only physically practiced, and the third was not practiced at all. At the end of the study none of the female basketball players reported having to adjust the imagery that was given to them in order to suit personal needs, so they all used the initial script that was given to them. Despite there being a positive effect when physical and imaged practice were combined to the control condition, extraneous variables such as temporal and spatial uncertainties were listed as needing to be considered in future studies in order to further validate the findings of this study. However, the effect of the imagery intervention was shown to facilitate a significant difference between the per-test and post-test scores regarding improved performance in open skills as awarded by coach to the mental practice and physical practice groups.

Fazel et al. (2018) showed the effects of different types of imagery delivery on performance and self-efficacy. Alongside the capacity of imagery to improve skill acquisition and performance in sport, imagery has also been used for the purposes of enhancing motivation and self-confidence (Martin et al., 1999). Previous studies have shown that the effectiveness of imagery is dependent on a variety of factors including how it is delivered (e.g., Morris et al., 2005; Nordin & Cumming, 2005; Wakefield & Smith, 2012). On this basis, how imagery is delivered to athletes in order to provide these benefits however was also investigated by Fazel (2015) in her thesis. Fazel et al. (2018) focused the delivery framework through constructing routine imagery (RI) and progressive imagery (PI). In terms of this study, RI referred to participants imaging the exact same scenario without any changes throughout the entire implementation period. PI on the other hand saw the participants put various elements of imagery in place in a controlled and progressive manner. In the case of the latter, the imagery training programs began with few simple images that were then built upon with more and more complex information. The other form of training method used in the study was retrogressive imagery (RETI), which is the reversed process of PI. A mixture of limited-ability (60 participants) and highly-skilled (49 participants) basketball players aged between 18 and 37 years were tested using the Sport Imagery Ability Measure to ensure they had at least moderate ability in sports. Once deemed as eligible, the participants were randomly allocated into one of the four groups: RI, PI, RETI or control (C). Those in the three imagery groups were instructed to complete three imagery sessions a week over a period of four weeks (totalling 12) and had their FT performance tested after every three sessions. Post-test data obtained from Study 1 demonstrated that participants in the RETI group experienced improved performance and significantly higher levels of self-efficacy than those in the PI and C conditions respectively. In Study 3, PI training was selectively chosen as the method that was to be tested on highly-skilled basketballers who play competitively. This saw a much smaller group of participants partake in the research, with only five male basketball players engaged in this phase of the research. Through visual and split technique analysis of the data obtained at the end of the study, all five players had made an improvement in their performance when compared to the pre-test. In formulating a conclusion for the three studies, Fazel et al. stated that the most effective way to deliver imagery to an athlete is solely dependent on the level of skill they possess, there is not a one-size fits all solution.

A multi-intervention design was developed by Kendall, Hrycaiko, Martin and Kendall (1990) to analyse the impact of mental practice on basketball performance. The researchers sought to determine the effects that imagery rehearsal, relaxation, and self-talk strategies had on a defensive basketball skill. The researchers outlined the contrasting opinions regarding the effectiveness of mental practice when seeking to enhance performance. Definitive conclusions are yet to be reached in this specific area of research (e.g., Feltz & Landers, 1983; Lang, 1977), which is why Kendall et al. conducted their own investigation. Four female intercollegiate basketball players aged between 18 and 22 years old who had no previous experience with mental skill training were each delivered a three-part intervention. These components were imagery rehearsal, relaxation, and self-talk. The results of the data obtained from the participants were interpreted by the first researcher of this study alongside the basketball head coach. It was revealed that all four of the subjects had clearly shown a positive increase basketball skill during game when comparing immediate pre-assessment and post-assessment data. The fact that this study conducted single-subject evaluation differs from other studies relating to this topic, where typical experimental and control groups were used. Furthermore, investigating a skill of defence in basketball represented a new area of performance psychology related to imagery.

Kanthack, Bigliassi, Vieira and Altimari (2014) reported an acute effect of motor imagery on basketball plyers' free throw shooting performance and self-efficacy. A group of 11 younger basketball players participated through assignment to either a motor imagery condition or a control group. Participants in motor imagery session watched a minute of NBA free throw scoring video to guide them, then minutes for an image of successful free-throws sessions and the control group were rested for minutes before players from both conditions completed a free throw shooting performance activity. There was no significant difference between median results for the two groups, but the measures of Smallest Worthwhile Change statistic indicated an 84% chance that mental training had a beneficial effect first two on performance free throw shooting in a series of 10 participants.

Imagery, Flow and Performance

Part of a continuing trend in positive psychology is to focus on flow and how it may affect the athlete's internal motivation and enjoyment, as well as performance in order to increase these antecedents of the flow state is imagery (Koehn et al., 2013; 2014). Researchers showed the used of imagery is a technique that can be applied effectively in sport to enhance performance, increase confidence, develop motivation, improve concentration, and reduce anxiety (Morris et al., 2005). Further studies have employed the combination of imagery and relaxation to enhance peak experience and performance in badminton (Hardy et al. 1996). Paivio (1985) suggested that imagery can help with motivating athletes, as well as teaching them arousal and emotional control. Both motivation and emotional control issues are important factors that can affect the flow state.

The effects of five imagery functions including cognitive specific, cognitive general, motivational specific, motivational general-arousal, and motivational general-mastery were focused specifically on flow state by Koehn et al. (2013). This study was designed to examine the effectiveness of an imagery intervention for enhancing the experience of flow experience and performance in young tennis players. Participants completed imagery sessions three times per week over six weeks. Researchers showed three participants using relaxation in conjunction with imagery sustained increased flow experience and four participants improved their performance.

They also found a strong correlation at the global level of flow with cognitive specific, cognitive general, and motivational general-mastery.

The relationship between psychological correlates and flow experience in tennis competition have identified by Koehn et al. (2013) identified. Participants' subjective questionnaire scores demonstrated that there were moderate to strong correlations between flow and confidence, imagery use, and action control (established in personality and anxiety research), whereas absorption was orthogonal to flow and negatively related to action control and zero correlated with confidence. They found that cognitive and motivational imagery facilitated flow through addressing these dimensions in particular: challenge-skill balance, clear goals, concentration, sense of control, and in particular autotelic experience. Furthermore, in similar sample Koehn et al. (2013) also examined the main interaction effects between psychological correlates, flow state, and performance in tennis serves and groundstroke performance. Researchers showed a significant interaction between imagery and confidence on flow experience in the groundstroke, but it did not affect the service performance. In addition, the interaction effects were not found to be a significant difference on performance outcome. Imagery and confidence are key concepts in the flow experience.

The effects of an on-court and off-court imagery intervention on performance in tennis and flow state was completed by Sardon, Mazaulan and Mohamed (2016). The participants for this study were five male and three female tennis players aged between 18 and 22 years old. They had at least nine years of tennis experience, six years of competition experience, and entered at least five tournaments per years. Results showed that the imagery intervention facilitated an increase in flow state and performance. For flow state, the on-court imagery intervention was more effective than the off-court intervention. On the other hand, the off-court imagery intervention was more effective than the on-court imagery intervention in facilitating an increase in performance. Therefore, the researchers advised that including on-court imagery interventions before or after field training could improve flow experience, and to incorporate off-court imagery interventions as part of the off-court training program to increase performance in tennis.

Koehn and Diaz-Ocejo (2016) utilised a single case study design to evaluate the effects of an imagery intervention to increase flow state with middle-distance runners. Three elite junior athletes aged between 14 and 18 years who all had at least three years of experience in training and competition at the indoor and outdoor national championships in the State of Qatar participated in the 4-week study. The Flow State Scale-2 Short Form version was used to examine the intensity of flow state and the performance task of 60 meters sprint was tested to improve movement and flow experience. Researchers showed the imagery intervention enhanced the flow experience, measured by global flow state, in all three elite junior athletes.

Research to compare the effects of motivational and cognitive imagery on flow and 10m air rifle shooting performance was conducted by Nojavan Alanagh and Atashgahian (2017). The 15-male shooters were divided into three groups of five and engaged in activities that included physical exercise, physical exercise with cognitive imagery, and physical exercise with motivational imagery. All participants did a shooting pre-test, then completed 18 exercise intervention sessions, then they did the post-test and finished with the Flow State Scale-2. Researchers showed both motivational imagery and physical exercise group significantly improved on flow and performance compared to other groups. Thus, it seems that use of motivational imagery by coaches and psychologists in comparison with cognitive imagery can contribute to more effective increase in the flow rate and performance of 10m air rifle shooting.

Hypnosis is a state of highly focused attention or concentration, often associated with relaxation, and heightened suggestibility. Hypnosis was effective on flow states and may contribute to an improvement in basketball shooting performance (Pates et al., 2002). Researchers in this study found that the results supported the notion that a hypnosis intervention can improve 3-point shooting ability and increase feelings and cognitions that are associated with flow in basketball players. Their findings also accorded with the outcomes of Lerner et al. (1996) who studied the effects of goal setting and imagery training programmes on the free-throw shooting performance of female basketball players. It has been postulated by researchers studying the effects of imagery on the learning of motor skills that imagery has the ability to facilitate the acquisition of a skill (Kanthack et al., 2014). One sport in particular has received a lot of attention when it comes to examining the effects of imagery, and that is basketball. Free-throw shooting in this sport has been used as an objective measure to assess the impact of imagery on improving performance.

Jeong studies the effect of imagery intervention to enhance “Flow State” in Dancers (Jeong, 2012). The group of 73 female and 15 professional male dancers aged between 20 and 38 participated in three studies with an overall aim of developing an imagery intervention specifically targeted to dancers. Study 1 had the purpose of investigating the relationship between flow experience and imagery use in terms of being able to identify what kind of imagery can predict flow experience during performance and training. The Dispositional Flow Scale-2 alongside the Sport Imagery Questionnaire were used in order to assess the flow state and flow experience during dance performances and training (Jeong, 2012). In terms of flow theory, an autotelic individual is one who is internally driven and does things for their own benefit (Csikszentmihalyi, 2000). This is opposed to those who need external sources of motivation in order for them to complete activities. Aside from the benefits of having strong intrinsic motivation, through numerous studies over the years it was found that autotelic individuals had more positive experiences in everyday life and had clearer goals of achievement compared to their non-autotelic counterparts (Asakawa, 2004).

In the second study, 20 professional Korean dancers provided evidence of what facilitators of flow were present when they performed. These were: achieving optimal arousal level, self-confidence, satisfying oneself, motivating oneself, exploring the dance and one's role in the performance uniting of movement and music, positive thoughts, and communication with the audiences based on their positive response. Imagery also proved to have other functions for the dancers, such as assisting them to become absorbed in the performance and to create links between thinking and movement of the body. The third and final study conducted was designed as a response to the conclusion the previous two studies: there was strong evidence supporting the notion that imagery may enhance flow among dancers. Hence, a study to test the effectiveness of an intervention designed to enhance flow state in dancers through the use of imagery was devised. 64 professional dancers were randomly assigned to one of two conditions, 33 participants completed flow imagery training whilst the remainder underwent pleasant place relaxation imagery training. All participants were instructed to complete the training three times a week for eight weeks and then proceed to use their devised imagery scripts for another period of three times in eight weeks. A 'Dance Rating Scale' was created in order to allow dancers and teachers to review their performances, The Flow State Scale-2 (FSS-2), Dispositional Flow Scale-2 (DFS-2), and Sport Imagery Questionnaire (SIQ) was used to assess flow state and to assess imagery use in dance. Whilst it was hypothesised that only the devised flow imagery intervention would enhance the flow experiences of participants and improve performance, the results showed that both the flow and relaxation imagery interventions affected dancers positively in terms of their dispositional flow and performance.

Nicholls, Polman and Holt (2005) conducted a study to investigate how the intensity and frequency of flow states and golf performance could be affected by an imagery intervention. Over a 12-week period, four high-performance golfers between 20-23 years of age were delivered individualised imagery interventions. Over the course of the study, each golfer's performance was assessed through a golf skill that was selected by each participant. The way in which each individualised script was devised was through interviewing each participant prior to the commencement of the intervention. They were asked questions that related to assessing their strengths and weaknesses from both a technical and mental perspective. As all four participants demonstrated the same psychological attribute (lack of confidence), they all received an MG-M intervention. The results of the study showed that three out of four of the golfers experienced an increase in global flow intensity, whilst all four had an increase in mean global flow frequency. Although all of the participants improved their performance overall, the results were only relatively small. Therefore, this study was concluded to show an existing relationship between flow and performance in sport and provides some evidence of an imagery intervention improving skills in golf competitive.

The Present Thesis on Imagery and Flow

Several studies on imagery and flow research have shown a positive influence on sport performance (e.g., Jackson et al., 2008; Koehn et al., 2013; Stavrou et al., 2015). Imagery is a psychological process that is widely used in sport to enhance performance and to modify psychological variables, including key antecedents of flow (Koehn et al., 2013). According to Nicholl's et al. (2005) imagery also can develop athletes' self-confidence, self-efficacy, collective efficacy, flow experience, sport skills and attention. Morris et al. (2005) agreed that imagery can facilitate flow because it affects the antecedent attributes of flow. Morris et al. approach was methodologically problematic, because the studies did not evaluate the quality of participants' reports of best performance experiences as being identical with or similar to flow state. Similar to imagery is a hypnosis has been used by researchers to improve flow. A series of studies using imagery to improve flow and performance has been conducted in tennis (Koehn et al., 2012; 2013; 2014; Pates, 2013), and in basketball (Pates et al., 2002; Vasquez, 2005). Imagery, which requires professional instruction and carefully structured intervention scripts, is a good option for using all the senses to help athletes to achieve flow state.

From the above analyses about flow, its dimensions, and the factors that affect flow, there is still a major area of research concerning how to help athletes get into flow more frequently. Because flow has some overlap with peak experience, increasing flow might enable people to enhance their enjoyment of their activities and want to repeat them. At the same time, due to its connection with peak performance, it will be valuable to have a consistent method to facilitate flow in athletes. Of all the factors that have influences on flow (facilitating, preventing, or disrupting), psychological skills are the ones that can be trained and fully integrated within the control of athletes. Imagery stands out among those psychological skills as a tool that is both useful and convenient to athletes.

Imagery in sport has been used as a psychological skill in many ways such as focusing on role modelling, goal setting, motivation, and anxiety management to enhance performance. Morris et al. (2004) stated that imagery in sport is mainly used for learning and practicing skills, developing tactical skills and strategies, previewing performance, reviewing performance, as well as facilitating recovery from injury and heavy training. Thus, imagery has been applied widely for performance enhancement in sport (Morris et al., 2005). Therefore, it is useful to understand more about imagery and our prior knowledge about it in the literature before determining the proper intervention for flow. This original research enhances knowledge about the mechanisms underlying flow in sport by systematically examining the effect on the experience of flow state of using imagery interventions to facilitate the psychological antecedents of flow. In this thesis, I extend information about flow in sport by examining the way in which the antecedents of flow state facilitate the experience of flow. In this thesis, I explored in greater depth this relationship, as well as how antecedents can be used to promote flow. At the same time, this thesis provides a clearly idea about how imagery influences flow in amateur basketball shooting by focusing on the nine flow state dimensions namely challenge-skill balance, merging of action and awareness, clear goals, unambiguous feedback, total concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience.

Aims

The research in this thesis has three aims. The first aim is to examine whether imagery of goal setting and feedback related to a sports task promotes clear goals and unambiguous feedback, enhances global flow state and targeted flow state dimensions, and facilitates sports performance in a context where challenge matches skills for the task (Study 1).

The second aim is to examine whether concentration imagery related to a sports task promotes concentration, enhances global flow state and the targeted flow state dimension, and facilitates performance in a context where challenge matches skills for the task (Study 2).

The third aim is to examine whether imagery of relaxation and confidence related to a sports task promotes a sense of control, enhances global flow state and the targeted flow state dimension, and facilitates performance in a context where challenge matches skills for the task (Study 3). Studying the impact on the experience of flow in sport of imagery interventions designed to increase proposed antecedents of flow should illuminate the mechanisms underlying the powerful, positive experience of flow in sport.

Structure of the Current Research Imagery Delivery Methods

The imagery intervention in Study 1 focused on challenge skill balance, clear goals, and unambiguous feedback **(Goal Setting)**. Setting appropriate goals is the key to Study 1. The goal should be specific, challenging, but achievable, it should match participants' skill levels, so challenge-skill balance is attained, and it should lead to unambiguous feedback. For these purposes, the scoring system for performance is too complex, so each individual participant's goals will be set in terms of the number of baskets attained out of 80 trials. This goal will comprise a challenging number of successful shots related to that participant's skill level, which will be based on their performance in the 80-shot basketball-shooting pre-test and discussion with the participant. Then imagery is based on a script that describes the task as challenging, but states that participants' skill match the challenge, as they perform successful shooting of baskets with clear feedback of the shooting shots going through the basketball ring cleanly and the final score reaching the desired goal. In Study 1, each participant in the imagery condition given individual goals in terms of the accuracy of their shooting to ensure that the challenge for that individual matches their skill level.

Study 2 **(Concentration)** the imagery intervention for enhancing total concentration describes imagery in which participants are totally focused on shooting basketballs. Because participants are competitive players with at least moderate skill levels, they are instructed to focus on their usual routine for shooting baskets. They are not directed to focus on skill execution because, at their skill level, the shooting skill should be automatic and focusing on the skill that leads them to switch to controlled processing with an accompanying decrement in performance (e.g., Mesagno, Marchant, & Morris, 2009). In this study participants are likely to focus on the feel of the ball, the location of the basket, and their readiness to shoot. Then they focus on the shot, the ball travelling to the basket, and the successful outcome of the shot.

Study 3 **(Sense of Control)** Sense of control is about feeling calm (relaxed yet alert) and confident. Thus, the imagery intervention focuses on sensations associated with feeling relaxed (low anxiety) but focused on the task. In addition, the intervention promotes feelings of confidence, reinforced by successful shooting as the session continues, thus, enhancing confidence over the course of a session and from session to session. For example, in this study participants might have more of an emphasis on a simple feeling of confidence. Then they feel in control and think about experiencing a positive attitude or confidence like they really believe they can achieve the goal that they have set for the imagery task. Following is an example of the first part of the imagery script for Study 3, involving sense of control.

CHAPTER 3

STUDY 1: THE EFFECTS OF A CHALLENGE-SKILL BALANCE, CLEAR GOALS, AND UNAMBIGUOUS FEEDBACK IMAGERY INTERVENTION TO ENHANCE FLOW EXPERIENCE AND INCREASE SHOOTING PERFORMANCE

Introduction

Csikszentmihalyi created the concept of an autotelic personality from his flow model. According to his original model (Csikszentmihalyi, 1975), flow is experienced when individuals perceive a balance between the challenge of an activity and their own skills. In the revised model, Csikszentmihalyi (1988) proposed that flow is experienced when both the challenge and the athletes' skills are high, as well as in balance. Most flow research to date has started from these assumptions and has operationally defined flow as experiences of balance (e.g., Nicholl's et al., 2005; Pates & Cowen, 2013; Pates et al., 2001; 2002; 2003). The challenge presented by any task largely depends on the goals that are set. Thus, setting clear goals that match each individual's skills is important to the creation of C-S balance. Furthermore, setting clear goals provides the basis for individuals to acquire unambiguous feedback from their performance in many contexts, such as basketball shooting (Pates at el., 2002), pistol shooting (Kuan, 2014), archery (Stavrou et al., 2015), and netball (Pates at el., 2003). Hence, in this study, the aim was to examine whether the imagery of three flow dimensions, C-S balance, clear goals, and unambiguous feedback, enhanced flow states and to examine how this affected the shooting performance of basketball players.

Method

Participants

Based on a power analysis with significance level set at .05, large effect size and power of 70%, I recruited 30 basketball players, but four participants were excluded, so 26 players (18 male, 8 female) from a Melbourne domestic league. The Imagery and Video condition participants in the study played in Victoria at the Spartans MSD Basketball Club. They played at three levels, namely Divisions A, B and C of the basketball league. All the players who volunteered for this study met the inclusion criteria, so there were no volunteers who were excluded. The mean age of the basketball players was 30.73 years old (*SD* = 7.93). The mean age of the participants in the Imagery condition (*n* = 11) was 29.73 (*SD* = 5.46) and the mean age of the participants in the Video condition (*n* = 15) was 31.47 years old (*SD* = 9.07). Participants in the Imagery condition had 8.09 (*SD* = 7.28) years of playing experience in competitive basketball, whilst those in the Video condition had 10.26 (*SD* = 7.55) years of playing experience. Participants had three sessions of basketball training per week. Those in the Imagery condition spent 3.09 hours per week training, compared to 3.8 hours per week for the Video condition participants. The Imagery condition participants in this study played in Divisions A and C of the basketball league and the Video condition participants played in Divisions A and B.

Study Design

In this study, I adopted a pre-test, intervention, post-test, two-group experimental design in a field setting. Participants completed basketball shooting and flow measures at the pre-test stage and I then assigned them randomly to the Imagery intervention condition and the Video control condition. I presented participants in the Imagery condition with imagery of basketball shooting designed to promote key antecedents of flow, specifically challenge-skill balance, clear goals, and unambiguous feedback. I presented participants in the Video condition with a placebo consisting of video of elite level performers (NBA players, the best in the world) performing successful basketball shooting from 2-point and 3-point positions. The intention was to provide participants in the video condition with material that they would consider to be relevant to their basketball interest, but which was not an active intervention. I asked participants in both conditions to complete an intervention logbook after each intervention session that indicated the dates and times when they completed the sessions, alongside any additional comments on their experiences and feelings during the sessions. This acted as a manipulation check for completion of the intervention sessions and the extent to which participants felt that they followed instructions for their intervention. Participants in both conditions completed six 15-minute intervention sessions over a 2-week period on their own. I chose to use 15 minutes for the duration of the Imagery condition and the Video condition because this is an imagery duration that has previously been found to be effective for this kind of task (Hinshaw, 1991). Following the six sessions of imagery or video, I conducted the post-test on basketball shooting performance and flow dimensions. Finally, all participants completed a short debriefing interview, which acted as a second manipulation check for compliance with all aspects of the study.

Measures

The study included a Demographic Form for collecting relevant demographic information, and I screened imagery ability to ensure moderate to high ability on key imagery dimensions and sense modalities. I measured basketball shooting performance and assessed the intensity of flow experience. In addition, I asked participants to complete an intervention logbook each time they finished an intervention session and a training diary whenever they undertook basketball training that included shooting practice. Finally, I conducted a debriefing interview with each participant at the end of their participation in the study.

Demographic Form. This form was used to collect information about gender, age, basketball playing level, years or competition, and frequency of practice. It was devised specifically for this research. The Demographic Form is presented in Appendix D.

Sport Imagery Ability Measure (SIAM; Watt et al., 2004; Watt et al., 2018). The SIAM was used to screen for at least moderate imagery ability in the visual and kinaesthetic senses and the vividness and control dimensions. This measure has a three-tier framework, with a general imagery-ability factor leading to image generation, feeling, and single-sense factors at the second level, and a third stage that details five individual dimensions, six sense modalities, and an emotion subscale. Participants are presented with four generic sports scenes. Participants decide on a specific example from their sport for each scene. The scenes consist of the home venue, a successful competition, a slow start, and a training session. The SIAM includes five dimensions, which are vividness, control, duration, ease, and speed of generation of images. There are six sense modalities, namely visual, auditory, kinaesthetic, tactile, gustatory, and olfactory. In addition, there is a subscale measuring experience of emotions associated with imagery. Participants imagine each scene for 60 seconds. After imaging a scene, they respond to 12 items, each representing a dimension, sense modality, or emotion subscale, by placing a cross on a 100-mm analogue scale. Adding scores on the four scenes from each subscale produces a score out of 400 for each dimension, sense modality, and emotion. The cut-off point for the lower end of moderate imagery ability for these subscales has typically been 150 points on the 400-point scale (Watt et al., 2004). The SIAM has shown internal consistency reliability ranging from good to very good with the alpha coefficient values of all scales above .75, except for speed and ease, which were .66 and .67, respectively, and moderate to very good test-retest reliability correlations of subscales over 4 weeks above .56, except for Auditory (.41), Ease (.5) and Speed

(.53) Watt et al. (2018). The SIAM has been used in a substantial number of studies, mainly to screen for imagery ability (e.g., scenes to examine the dimensional, sensorial, and emotional characteristics of generating images). The SIAM is presented in Appendix E.

Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002). Information on the intensity of a flow experience was assessed by the Flow State Scale-2, a 36-item scale measuring each of the nine dimensions of flow using four items. The response format for each item is a 5-point Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Responses to the four items for each dimension are summed up to give a score between 4 and 20 for that dimension of flow. The nine dimensions are challenge-skill balance, merging of action and awareness, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, and autotelic experience. The FSS-2 has sound reliability with its alpha range from 0.76 to 0.92 and validity (Jackson & Eklund, 2002) and is the most widely used measure of flow in sport (Jackson, 2011). The FSS-2 is presented in Appendix F.

Basketball Shooting Performance. Basketball shooting performance was measured by asking participants to shoot 80 shots from five angles around the key at two distances from the centre of the basketball ring, one in the 2-point scoring range at 4.5 meters and the other in the 3-point scoring range at 6.75 meters. For all shots, I passed the ball to the participants and they performed the shot as soon as they were ready. The standard instructions for shooting performance were that: (a) participants must stand on the pre-determined mark for each shot, with both feet on the ground square to the basket, unless they jump players were free to decide this for each shot they could perform a different mix at pre-test and post-test: (b) participants should ensure that they shoot firmly by relying on their posture or alignment, so that every time they catch the ball they catch it while standing on the designated mark with their arm angles already set to perform the shooting action; (c) participants were permitted to bounce the ball before shooting, if that felt more natural or comfortable; (d) if participants dropped the ball when I passed it to them, they were permitted to collect it, make sure they were on the mark, bounce the ball if that was their preference, and shoot. Participants took eight shots from each of the angles at each of the following locations: 90 degrees to the end line of the basketball court, 60 degrees to the end line on left and right, and 30 degrees to the end line on left and right. The locations of the shooting positions are illustrated in Figure 3.1. The recorded basketball players' shooting performance at pre-intervention and post-intervention by researcher assistant. During the shooting task, participants were given 8-10 minutes to make eight 2-point shots from each of the five angles (40 shots in total), prior to moving on to the 3-point shooting distance where they made eight shots at the same five angles (40 shots). Scoring was refined to emphasise accuracy, so 3-points were awarded for each clean basket, 2-points for shots that hit the ring and went through, 1-points for shots that hit the ring, but did not go through, and 0 for shots that missed the ring (Fazel et al., 2018). The range of points that could be achieved in total was 0 to 240. This scoring system has been used widely in studies involving basketball shooting to increase sensitivity in order to detect increases in accuracy over relatively short periods of time, when the number of baskets achieved might not increase significantly (e.g., Fazel et al., 2018; Singh & Deol, 2015; Wang, Marchant, Morris, & Gibbs, 2004). The scoring sheet is presented in Appendix I.

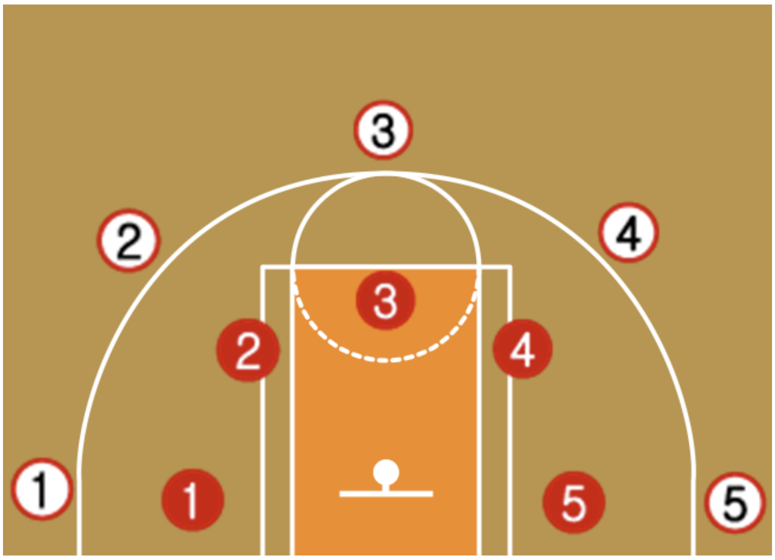

Figure 3.1. Diagram of the basketball court and shooting task locations

Intervention Logbook. I gave participants an intervention logbook prior to the start of the Imagery or Video intervention. I asked them to note the date and time of day on each occasion that they performed their intervention and to enter any comments about their experience of imagining the basketball shooting task, including notes on what worked well for them and anything that was not so good, such as distractions that they faced during imagery. I also included space in the logbook for comments on each imagery session during the intervention phase, such as image clarity, or for their experiences of watching the basketball shooting in the Video intervention. Completed after every session, the logbook acted as a manipulation check of the extent to which participants adhered to their intervention and the impact that the intervention had on them. An example of the format of the intervention logbook is presented in Appendix H.

Training Diary. I gave participants a training diary prior to the start of the Imagery or Video intervention in which to record the dates, times, and duration of basketball shooting practice sessions. I also asked how many hours per week participants spent doing basketball-shooting practice. The format of the training diary is presented in Appendix L.

Debriefing Interviews. The debriefing interviews were short duration and analysis was impressionistic. The topics examined were designed to gain insight into participants' experience of imagery or video of basketball shooting, flow, and performance and were based on the following questions: What was your experience of your imagery/video during the sessions? What was your experience of flow during the imagery/video sessions? What was your experience of the imagery of performance during the imagery sessions or experience of the act of basketball shooting during the video sessions? These questions were followed up with clarification and elaboration probes as appropriate. Clarification probes aimed to elucidate participants' statements that I considered to be unclear. They were of the form, "Can you please tell me what you meant by…?". Elaboration probes aimed to gather additional information on issues that participants raised but did not expand on. They were in the following form, "Can you please tell me more about…?". The debriefing interviews served as a further manipulation check at the end of the whole study, including checks on how well participants understood the instructions in their intervention and how well they were able to do what the intervention guided them to do. The guide for the social validation interviews is presented in Appendix J.

Interventions

Imagery Condition. The imagery intervention was created to incorporate the best practice of imagery design to guide development of the imagery based on goal setting principles. Cooley, Williams, Burns & Cumming, (2013) found evidence of many inconsistencies between interventions, demonstrating a need for more comprehensive practical guidelines to be proposed for writing imagery scripts. The key aspects of the script in this study were setting appropriate goals to achieve a C-S balance and providing the basis for unambiguous feedback. Having participants set appropriate goals was the key to Study 1. Goals need to be specific, challenging, but achievable (Swann et al., 2016). They should match the participants' skill level, so that C-S balance is attained Jackson and Csikszentmihalyi (1999). They should lead to unambiguous feedback. In relation to the purposes of this study, the scoring system for performance was too complex for participants to mentally keep score. Thus, goals were set in terms of the number of baskets attained out of 80 shots, which allowed participants to maintain a tally of their successful baskets that they could readily compare to their goal, thus, providing clear feedback. To create an effective imagery program that reflected personal success for each participant, imagery was based on a script that described the basketball shooting task as challenging, but guided participants to imagine the extent to which their skills matched the challenge established by the goals that I set for them. Participants imagined performing successful shooting of baskets with clear feedback of the shots going through the basketball ring cleanly and the final score reaching the desired goal. Thus, each participant in the imagery condition was given an individual goal in terms of the accuracy of their shooting to ensure that the challenge set for that individual matched their skill level. Individuals' imagery goals were based on their pre-test shooting performance. To make the goals clear, challenging, yet attainable, they were set at that participant's number of successful pre-test baskets plus 10% for 2-point shooting and 3-point shooting, respectively. For example, if a participant scored 30 baskets for 2-point shooting and 20 baskets for 3-point shooting, their goals for imagery would be 33 baskets for 2-point shooting (3 is 10% of 30) and 22 baskets for 3-point shooting (2 is 10% of 20).

Following is an example of the first part of the imagery script for Study 1, involving challenge skill balance, clear goals, and unambiguous feedback.

> "In this session you will be guided to relax because relaxation helps people to produce effective imagery. Then you will imagine that you are standing at one end of your usual training court and that you are going to shoot baskets with the goal of shooting

> at least the number of baskets out of 80 trials that we agreed in our goal-setting discussion. This was a challenging goal, but you know you have the skill to achieve this goal. In the imagery session you won't imagine doing 80 trials because that would be rather long for you to stay focused on the imagery. Also, because it is not good to imagine negative outcomes, you will imagine every shot during the imagery being successful. Then we will move the imagery to the last few shots out of 80 that need to be successful for you to achieve your goal. Again, you will imagine each shot going through the ring and you achieving your goal and feeling good about your performance."

Participants completed six imagery-training sessions over a 2-week period, with each session lasting 15 minutes. They were required to imagine shooting 2- and 3-point shots from each distance and angle used in the performance test. The imagery sessions were conducted on Monday, Wednesday, and Friday of each week, with the key aspect of the script in this study being imagining attaining the goal set. The basketball coach of the team that the players came from and a PhD researcher who was also an international level basketball player and referee gave feedback that helped to finalise the scripts. The script for the Imagery intervention condition is presented in Appendix G.

Video Placebo Condition. The video sessions were conducted on Monday, Wednesday, and Friday of each week. I chose games from the Finals Series of the USA NBA (2015) because they are especially exciting and interesting. The different videos showed successful shots by expert players (US National Basketball Association [NBA]) shooting 2- and 3-point shots from a range of angles, which is consistent with the real performance task, which participants did at pre-test and post-test stages. The intention was that participants in this condition would perceive the task they were performing to be relevant to the performance of basketball shooting. I gave participants in this condition no instructions about what to do during the 15-minute sessions. Participants were given a different video to watch in each session.

Procedure

Prior to commencement, the research received approval from the Victoria University Human Research Ethics Committee. I recruited participants through basketball players' coaches with permission from their basketball clubs in Melbourne, Australia. Coaches passed the information on to players they coached. Players read an Information Statement describing the purpose of the study and all the procedures (Appendix B). Players who wished to participate in the study as volunteers signed and gave me a consent form (Appendix C). At my initial meeting with potential participants, I administered the Demographic Form and the SIAM to select moderate-to-high-ability imagers. Those who met the criteria for 30 players inclusion in the study became participants. Then they completed a basketball-shooting task, shooting 2- and 3-point shots from various angles. After that, I assigned participants to the Imagery or Video (attention control) condition at random until there were 15 participants in each condition. Once they completed the performance pre-test, which entailed completing the 80-shot 2- and 3-point basketball shooting performance task, I gave participants up to 30 minutes to fill out the FSS-2. At this point, I gave each participant a copy of the intervention logbook and the training diary. I asked participants to complete the training diary every time they did a training session that included shooting practice. Then I delivered six imagery or video placebo sessions over two weeks and I instructed participants in the Imagery condition to use imagery for 15 minutes in each of the six sessions, as prescribed by listen to the recorded imagery script using a MP3 audio files. Participants took part in imagery rehearsal or watched successful basketball shooting three times a week on Mondays, Wednesdays, and Fridays for two weeks. I asked them to comment on their experiences of imagery or watching video and to complete the intervention logbook at the end of each session, as a manipulation check. Following the six sessions of imagery or video, I conducted the post-test on basketball shooting performance. Then after 5 to 10 minutes rest I asked participants to complete the FSS-2 and allowed them up to 30 minutes to complete the scale. At this stage, I collected their completed training diaries. At the end of the study, I conducted a short debriefing interview with each participant on their flow and intervention experiences, as well as asking them to convey information on their performance during the study. Then I thanked the players for participating in the study.

Analysis

I examined the manipulation check data in the intervention logbook and comments made during the social validation interview to ensure that participants followed the instructions they were given, including carrying out the assigned intervention condition to the best of their ability. Then I conducted data analysis using the independent-samples T-tests and Two-Way Mixed-design ANOVA. First, I conducted T-tests to compare the Imagery and Video conditions on the 12 SIAM subscales at pre-test to examine whether there was any difference in imagery ability between the two conditions, which might have caused biased results for flow or basketball shooting performance. Second, I conducted the independent-samples T-tests on participants' experience of competitive basketball and their training diary data to determine whether there was any significant difference in competition experience, or the amount of shooting practice conducted by participants in the Imagery and Video conditions. Then, I conducted Two-Way, Mixed-design ANOVA to compare the Imagery and Video conditions on all nine flow dimensions, in which experimental conditions (Imagery and Video) was the independent groups' factor, occasions (pre-test, post-test) was the repeated measures factor, and conditions x occasions was the interaction factor. Next, I tested 2- and 3-point basketball shooting performance, using similar Two-Way, Mixed-design ANOVAs. I also examined participants' intervention logbooks further for additional evidence of their conduct throughout the study. Finally, I examined the participants' short debriefing interviews further to gain a greater depth of understanding of their experiences during the study.

Results

In this section, I first report on the manipulation checks I did to determine whether participants in the two intervention conditions thought, felt, and behave as intended. Then I consider whether participants showed adequate imagery ability and whether levels of imagery ability were equivalent between the two intervention conditions. Next, I report on the equivalence of basketball experience and amount of basketball shooting practice during the study between the two research conditions. Having addressed these issues, I examine global flow state and flow state dimensions, comparing the two intervention conditions, changes from pre-test to post-test, and the interaction of conditions and occasions. Then, I report on basketball shooting performance between the intervention conditions, from pre-test to post-test, and the interaction between conditions and occasions. Finally, I explore insights provided by participants in the brief social validation interviews.

Manipulation Check

The Manipulation Check produced information that indicated that several participants in the Imagery group should be removed from the study because they did not complete the six sessions of the Imagery intervention. At the beginning of the study, it was expected that 15 basketball players would be placed in each of the designed conditions. Once the data had been collected, the first step of the results was to conduct a manipulation check. This was done by examining the logbooks and social validation interviews to ensure that participants undertook the interventions to which they had been assigned. Participants' responses indicated that all 15 participants in the Video Placebo condition completed the six video sessions. However, four participants in the Imagery intervention did not complete the imagery sections of the study. It appeared from the logbooks that these participants only completed one or two imagery sessions. Further details emerged from the social validation interviews, which revealed that these participants did not believe that imagery could be of benefit to them, so they stopped following the imagery scripts. Thus, they opted out of the study by default, so I had no option but to eliminate them from the study. This alteration resulted in all 15 basketballers remaining in the Video Condition, but only 11 basketball players being retained in the Imagery Condition. The key factor in participating in the study was that all of the participants were required to complete the six sessions in their assigned intervention condition over two weeks. The evidence from the logbook and social validation interview manipulation checks indicated that the four participants who I had to eliminate were not convinced that the Imagery intervention would be effective, so they did not do it. Participants voiced concerns about the impact of busy routines, having poor motivation, and issues of not experiencing any impact of the imagery in the one or two sessions that they completed. To address this problem in future studies, a more thorough introduction to the benefits of imagery is recommended to ensure that participants have confidence that imagery can be beneficial for performance, so they are motivated to complete imagery interventions.

Imagery Ability Screening

I administered the SIAM as a screening device prior to the pre-test to check that potential participants had sufficient imagery ability to undertake the Imagery intervention and that participants in the Video intervention were equivalent in terms of imagery ability to Imagery intervention participants in order to minimise any bias that might be associated with imagery ability. As shown in Table 3.1, the means on the four key factors of imagery ability, namely the visual and kinaesthetic sense subscales, and the vividness and control dimension subscales of the SIAM were all moderate to high. In addition, all potential participants demonstrated at least moderate levels of imagery ability on these four key subscales. The results of the independent-samples T- test showed no significant differences between the means for the Imagery intervention participants and the Video intervention participants on any of the four key imagery ability subscales, so I concluded that all the potential participants were acceptable for the study and that there were no systematic differences between the two intervention conditions in terms of imagery ability.

Table 3.1.

Means and Standard Deviations, T-test, F-Values and p-Values of SIAM Scores for the Imagery Intervention and the Video Placebo Intervention

SIAM Subscales	CONDITION	*M*	*SD*	*F*	*p*
VISUAL	Imagery	268.81	52.81	.65	.42
	Video	256.26	62.21		
KINAESTHETIC	Imagery	250.09	45.95	1.29	.26
	Video	237.00	56.30		
VIVIDNESS	Imagery	275.63	44.21	.32	.57
	Video	246.06	58.51		
CONTROL	Imagery	264.00	46.97	.10	.75
	Video	244.53	52.88		

Basketball Competition Experience and Training During the Study

I examined basketball competition experience from the Demographic Form and basketball training during the study from the training diary to determine whether these variables differed in a systematic manner that might affect flow or performance during the study. Analysis of basketball competition experience indicated that participants in the Imagery intervention reported a mean of 8.09 (*SD* = 7.28) and participants in the Video placebo condition reported a mean of 10.26 (*SD* = 7.55). The independent- samples T- test indicated that there was no significant difference between the two conditions, F (1, 24) = .14, $p = .70$, $\eta^2 = .02$. Analysis of the training hours from training diaries indicated that participants in the Imagery intervention reported a mean of 3.09 (*SD* = 2.02) and participants in the Video placebo condition reported a mean of 3.80 (*SD* = 3.50). The independent-samples T-tests indicated that there was no significant difference between the two conditions, F (1, 24) = .35, $p = .55$, $\eta^2 = .01$. Because there was no significant difference between conditions in terms of basketball competition experience or basketball training during the study, I conducted analyses of global flow state, flow state dimensions, and basketball shooting performance at pre-test and post-test in the following sections, using Two-Way ANOVA.

Global Flow State and Flow State Dimensions

The results for the nine flow dimensions and global flow are presented graphically in this section. Then the results of the ANOVAs are presented in Table 3.2. Global flow state is calculated by summing the values for the nine flow dimensions for each participant at pre-test and then again at post-test. The meaningfulness of the measure of global flow state is as an experience that is extremely rewarding, an experience that is highly enjoyable and an experience that individuals want to recapture. One reason to include analysis of global flow state is because the vast majority of previous quantitative research on flow has used global flow state as the main indicator of flow. However, as the name suggests, global flow state is a mean representing a conglomerate of scores on nine flow dimensions that reflect diverse phenomena. Many combinations of different levels of these nine flow state dimensions can lead to exactly the same score on global flow state. However, few studies have examined the nine flow state dimensions separately (Koehn et al., 2012; 2013; 2014). I propose that study of the effects of interventions on the flow state dimensions could enhance understanding of the mechanisms underlying flow. In addition, in the present thesis, the main aim is to examine the proposal of Stavrou and Zervas (2004) that certain flow state dimensions are antecedents of flow. Based on Stavrou and Zervas' proposal, it is predicted that administering an imagery intervention to enhance clear goals in a way that creates a C-S balance, providing the opportunity to gain unambiguous feedback should lead to increases in the measures of those three targeted interventions in the FSS-2, as well as increases in global flow state. Thus, here I report results for global flow state and all nine flow state dimensions.

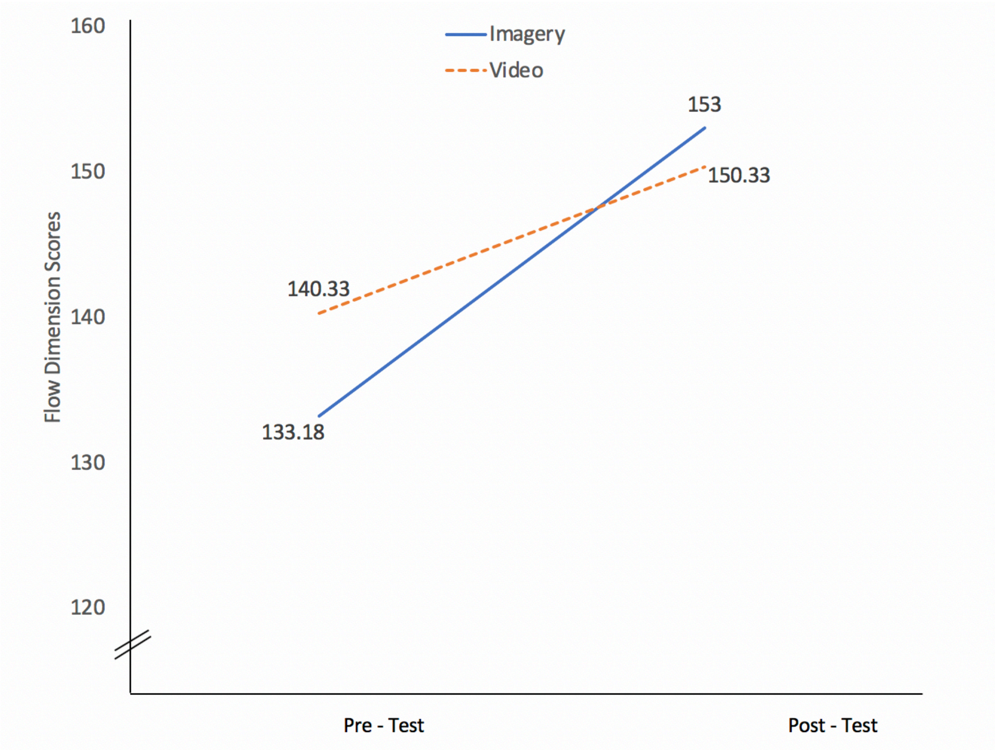

Figure 3.2 Mean Global flow state for the Imagery and Video conditions at pre-test and post-test

Figure 3.2 shows the means for global flow state in the Imagery and Video conditions at pre-test and post-test. Both conditions increased from pre-test to post-test with only a small difference in slope, which was lower at pre-test and higher at post-test for the Imagery condition than the Video condition. Two-Way, Mixed-design ANOVA with one independent groups' factor, condition, with two levels (Imagery, Video) and one repeated measures factor, occasion, with two levels (pre-test, post-test) revealed no significant condition main effect, but it did reveal a significant main effect of occasion ($p < .001$), with a very large effect size, and a significant interaction effect ($p = .01$), with a large effect size (See Table 3.2). The results indicate that significant interaction effect in which the Imagery condition showed a greater increase than the Video condition suggests that the post-test increase for the sample might be largely attributable to the increase in the Imagery condition from pre-test to post-test.

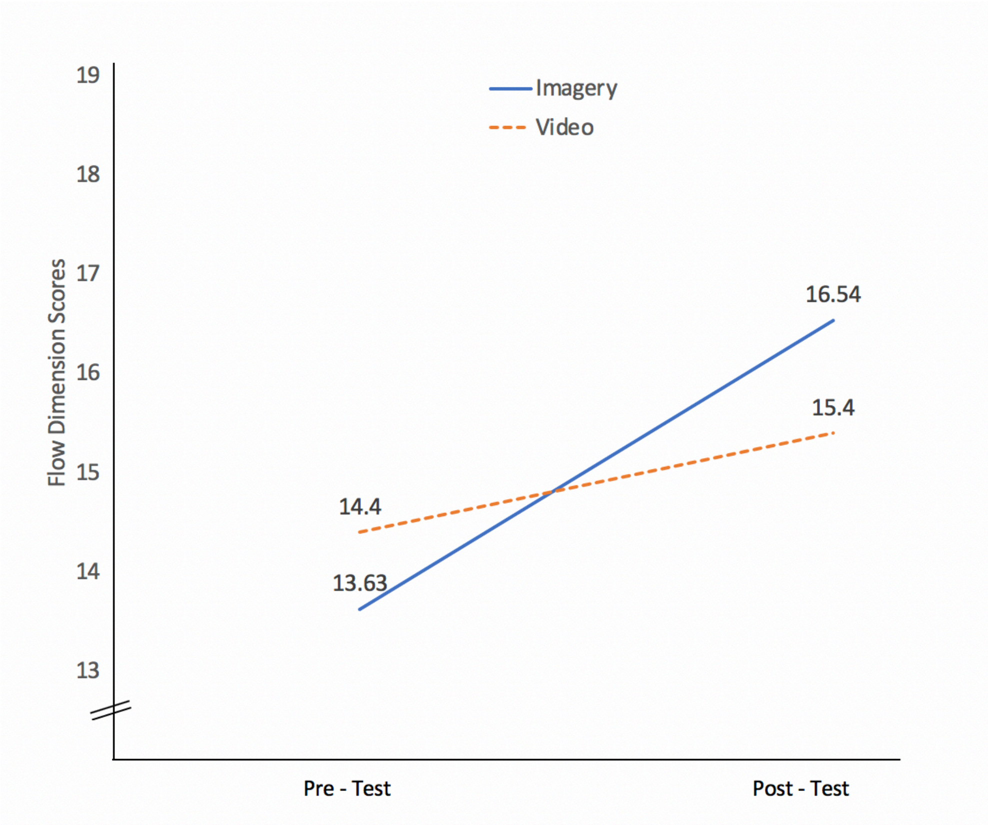

Figure 3.3. Mean C-S Balance for the Imagery and Video conditions at pre-test and post-test

Figure 3.3 shows the means for the C-S balance dimension for the Imagery and Video intervention conditions at pre-test and post-test. Both conditions showed increases in C-S balance from pre-test to post-test, with a greater increase for the Imagery condition, which was lower at pre-test and higher at post-test than the Video condition, depicting a disordinal interaction. Two-Way Mixed-design ANOVA, with one independent groups' factor, condition, with two levels (Imagery & Video) and one repeated measures factor, occasion, with two levels (pre-test and post-test) revealed a significant main effect of condition ($p < .001$), with a very small effect size, and a significant main effect of occasion ($p < .001$), with a very large effect size, and a significant interaction effect ($p = .02$), with a very large effect size (see Table 3.2). Participants in the Imagery condition scored significantly higher at post-test than they did at pre-test in comparison with participants in the Video condition.

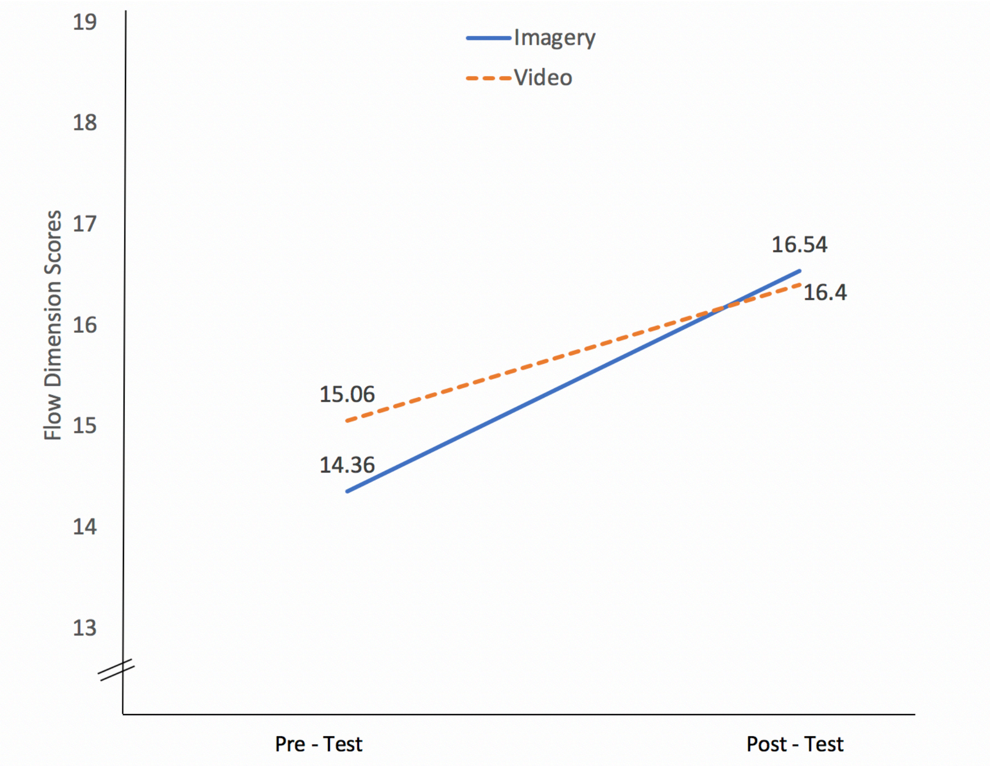

Figure 3.4. Mean Merging of Action Awareness for the Imagery and Video conditions at pre-test and post-test

Figure 3.4 shows the means for the merging of action and awareness dimension of flow state. Both conditions increased from pre-test to post-test with only a small difference in slope. Two-Way, Mixed-design ANOVA with one independent groups' factor, condition, with two levels (Imagery, Video) and one repeated measures factor, occasion, with two levels (pre-test, post-test) revealed no significant condition main effect, but it did reveal a significant main effect of occasion ($p < .001$), with a very large effect size, and no significant interaction effect (See Table 3.2). The significant occasion main effect suggests that participants in the sample increased the flow state dimension of merging of action and awareness, regardless of their intervention condition.

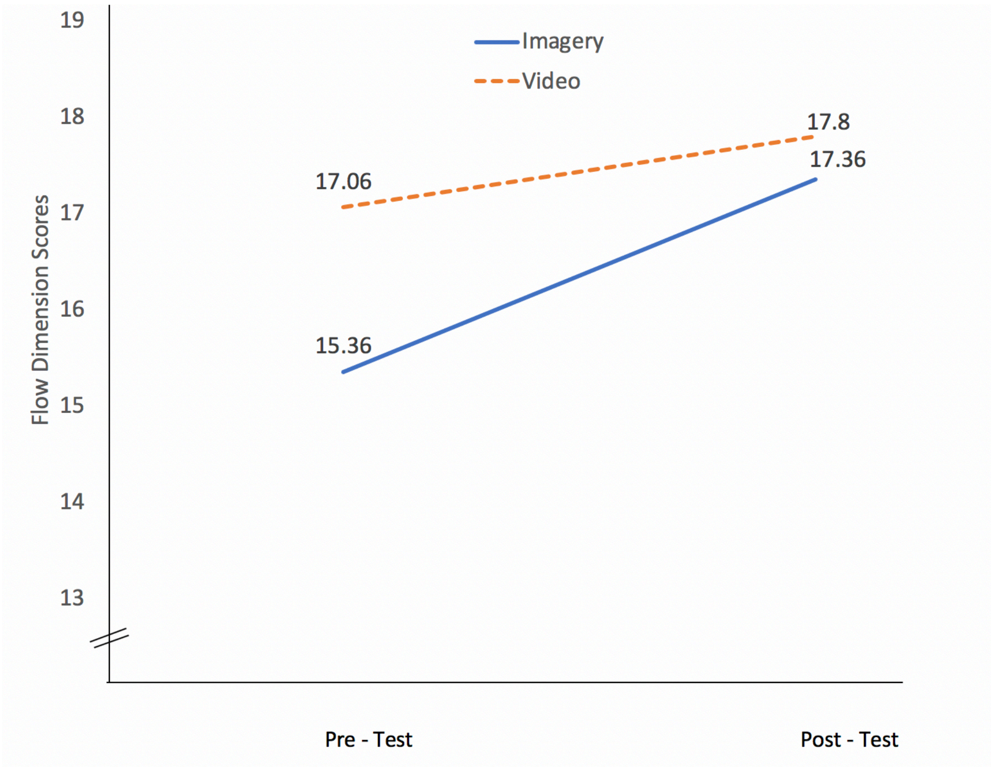

Figure 3.5. Mean Clear Goals for the Imagery and Video conditions at pre-test and post-test

Figure 3.5 shows the means for the clear goals flow state dimension for the intervention conditions and occasions. The Imagery condition showed a substantial increase from pre-test to post-test, whereas the Video condition showed only a shallow incline. Because the Imagery condition mean was much lower than the Video condition mean at pre-test, this graph depicts an ordinal interaction. Two-Way, Mixed-design ANOVA revealed no significant condition main effect, but it did reveal a significant occasion main effect ($p < .001$), with a very large effect size, and a significant interaction effect ($p = .03$), with a large effect size. The occasion main effect suggests that participants in both intervention conditions increased on the clear goals flow state dimension from pre-test to post-test. However, the significant interaction effect indicates that the increase was significantly greater for the Imagery condition than the Video condition.

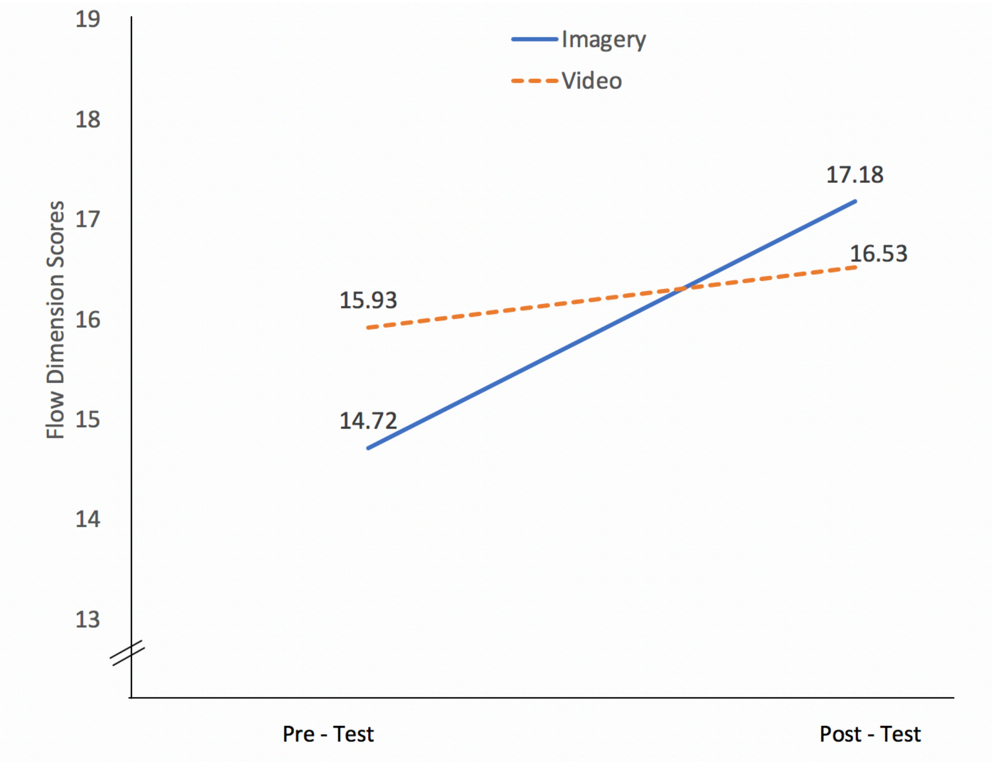

Figure 3.6. Mean Unambiguous Feedback for the Imagery and Video conditions at pre-test and post-test

Figure 3.6 shows the means for the unambiguous feedback flow dimension for the Imagery and Video intervention conditions at pre-test and post-test. The Imagery condition shows a relatively steep increase from pre-test to post-test, whereas the Video condition shows only a shallow increase. The crossover of the Imagery and Video conditions in this graph depicts a disordinal interaction. Two-Way, Mixed-design ANOVA for unambiguous feedback revealed no significant main effect of condition, but it did reveal a significant main effect of occasion ($p < .001$), with a very large effect size, and a significant interaction effect ($p = .03$), with a large effect size. The significant interaction effect in which the Imagery condition showed a larger increase than the Video condition suggests that the post-test increase for the sample might be largely attributable to the increase in the Imagery condition from pre-test to post-test

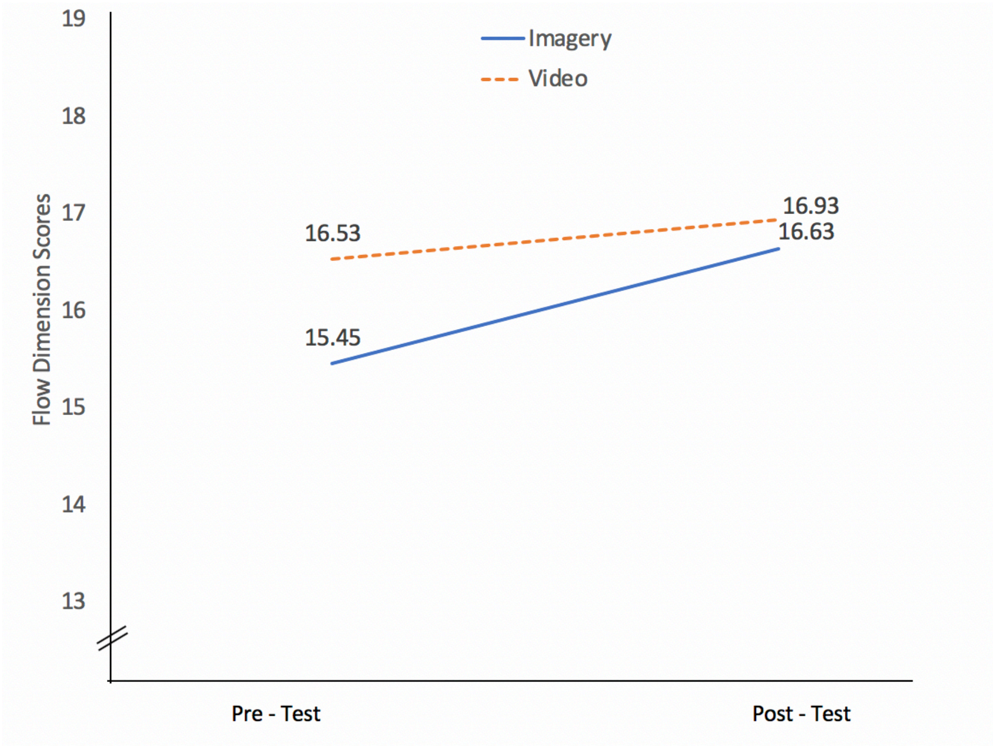

Figure 3.7. Mean Concentration on the Task at Hand for the Imagery and Video conditions at pre-test and post-test

Figure 3.7 shows the means for the concentration on the task at hand flow dimension for the Imagery and Video intervention conditions and occasion. Both conditions showed shallow increases from pre-test to post-test. Two-Way, Mixed-design ANOVA for concentration on the task at hand revealed no significant condition main effect, a significant main effect of occasion (p = .03), with a very large effect size, and no significant interaction effect. Participants in the whole sample increased on the flow state dimension of concentration on the task at hand from pre-test to post-test.

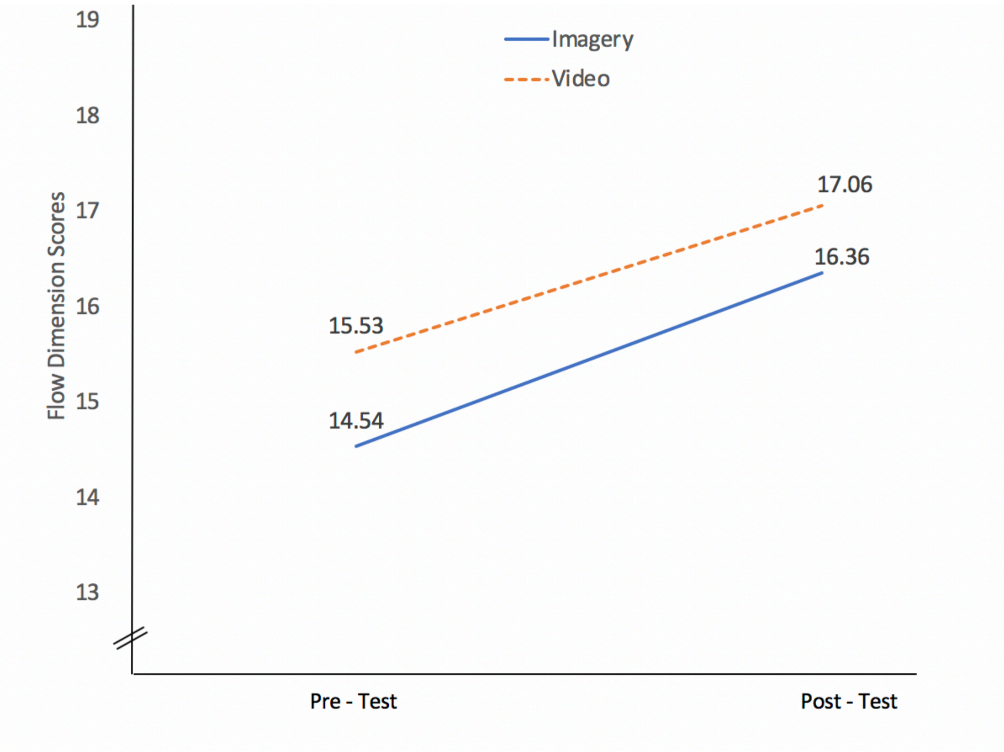

Figure 3.8. Mean Sense of Control for the Imagery and Video conditions at pre-test and post-test

Figure 3.8 shows the means for the sense of control flow state dimension for the Imagery and Video interventions and occasion. The pre-test mean for the Imagery condition was noticeably lower than that for the Video condition and the slopes were close to parallel, indicating similar increases in flow state for both intervention conditions. Two-Way, Mixed-design ANOVA for sense of control revealed no significant condition main effect, but there was a significant main effect of occasion ($p < .001$), with a very large effect size, and no significant interaction effect. Participants in the whole sample increased on the flow state dimension of sense of control from pre-test to post-test.

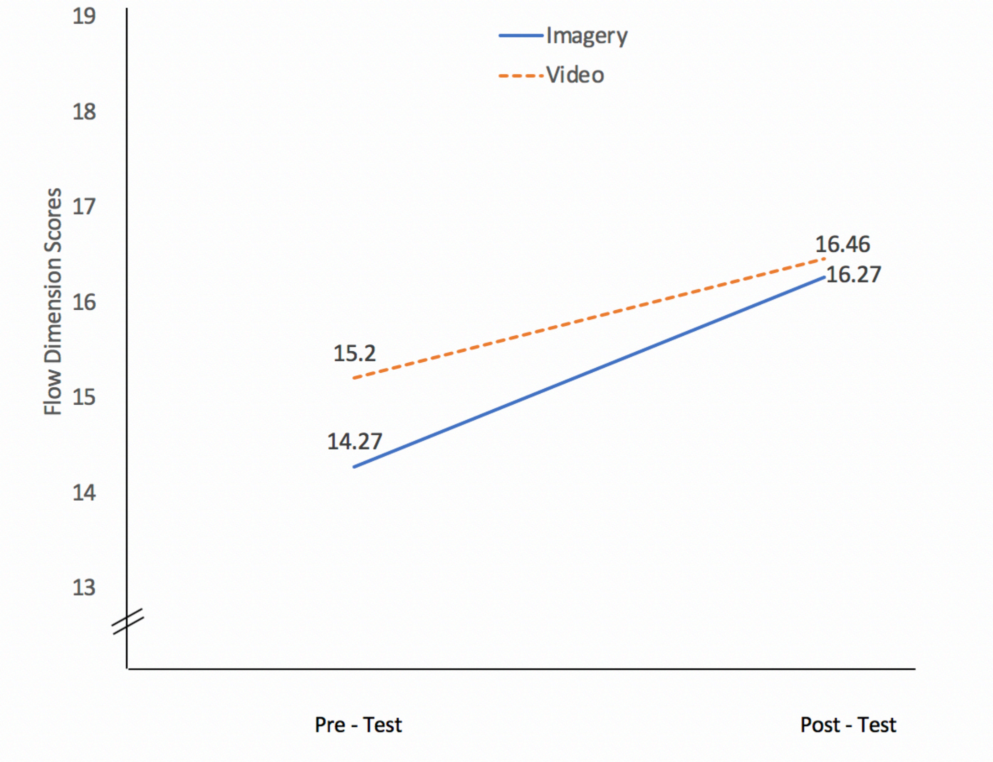

Figure 3.9. Mean Loss of Self-consciousness for the Imagery and Video conditions at pre-test and post-test

Figure 3.9 shows the means for the loss of self-consciousness flow state dimension for the Imagery and Video intervention conditions and occasion. Both conditions showed increases from pre-test to post-test. The increase for the Imagery intervention was relatively steep, whereas the increase for the Video condition was moderate in slope. Two-Way, Mixed-design ANOVA for loss of self-consciousness revealed no significant condition main effect, a significant main effect of occasion (p = .002), with a very large effect size, and no significant interaction effect. Participants in the whole sample increased on the flow state dimension of loss of self-consciousness from pre-test to post-test.

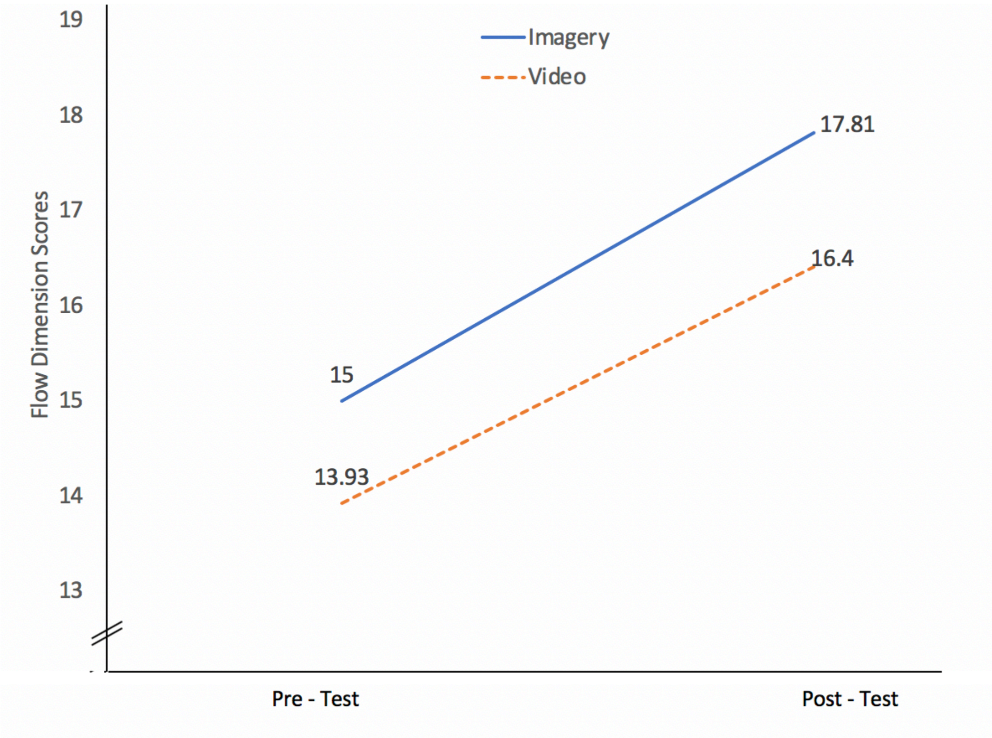

Figure 3.10. Mean Transformation of Time for the Imagery and Video conditions at pre-test and post-test

Figure 3.10 shows the means for the transformation of time flow state dimension for the Imagery and Video intervention conditions and occasion. Both conditions showed increases in flow from pre-test to post-test that had steep inclines. The lines were close to parallel, with the Imagery condition starting at a notably higher level at pre-test and staying at a considerably higher level at post-test. Two-Way, Mixed-design ANOVA for transformation of time revealed no significant main effect of condition, a significant main effect of occasion ($p < .001$), with a large effect size, and no significant interaction effect. Participants in the whole sample increased on the flow state dimension of transformation of time from pre-test to post-test.

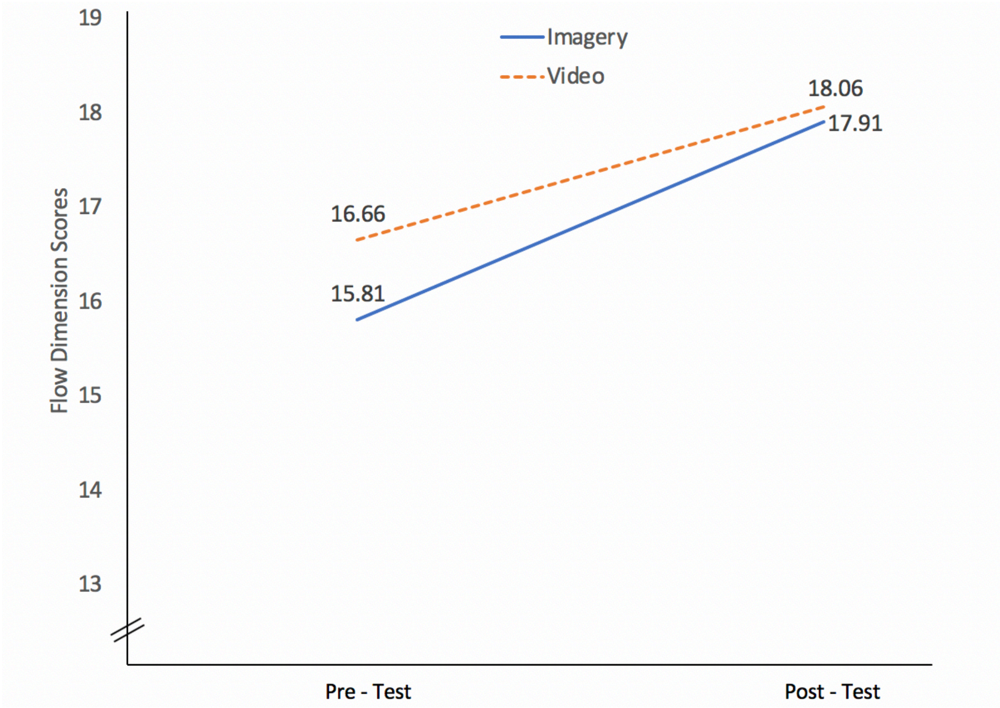

Figure 3.11. Mean Autotelic Experience for the Imagery and Video conditions at pre-test and post-test

Figure 3.11 shows the means for the autotelic experience flow state dimension for the Imagery and Video intervention conditions and occasion. Both intervention conditions showed moderate to steep increases from pre-test to post-test. The slope for the Imagery intervention condition was only a little steeper than that for the Video condition. Two-Way, Mixed-design ANOVA for autotelic experience revealed no significant condition main effect, but it did reveal a significant main effect of occasion ($p < .001$), with a large effect size, and no significant interaction effect. Participants in the whole sample increased on the flow state dimension of autotelic experience from pre-test to post-test.

The means and SDs for the Imagery and Video intervention conditions for all nine flow state dimensions are presented in Table 3.2. This table also includes the *F*, *p*, and η^2 Values for the conditions main effect, the occasions main effect, and the interaction effect for each flow dimension.

Table 3.2.

Means and Standard Deviations, F, p, and η^2 Values for the Nine Flow Dimensions for the Imagery and Video Intervention Conditions at Pre-test and Post-test

Flow Subscales	Condition	Pre - test		Post -Test		Condition			Occasion			Interaction		
		M	SD	M	SD	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
Global Flow State	Imagery	133.18	17.29	153.00	11.42	.19	.67	.008	70.67	<.001*	.74	7.25	.01	.23
	Video	140.33	14.47	150.53	13.47									
Challenge Skill Balance	Imagery	13.63	2.01	16.54	1.50	.06	<.001*	.002	26.18	<.001*	.52	6.24	.02*	.20
	Video	14.40	2.06	15.40	2.52									
Merging of Action Awareness	Imagery	14.36	2.20	16.54	1.50	.14	.71	.006	27.29	<.001*	.53	1.59	.22	.06
	Video	15.06	2.18	16.40	2.09									
Clear Goals	Imagery	15.36	3.01	17.36	2.11	1.86	.18	.07	22.34	<.001*	.48	4.79	.03*	.17
	Video	17.06	1.83	17.80	1.47									
Unambiguous Feedback	Imagery	14.72	2.28	17.18	1.94	.11	.74	.005	15.06	.001*	.38	5.55	.03*	.18
	Video	15.93	2.43	16.53	2.38									
Concentration on the task at hand	Imagery	15.45	2.16	16.63	1.50	1.05	.31	.04	5.20	.03	.18	1.27	.27	.05
	Video	16.53	2.09	16.93	1.75									
Sense of Control	Imagery	14.54	2.16	16.36	1.85	.84	.37	.03	18.32	<.001*	.43	.13	.72	.005
	Video	15.53	2.87	17.06	2.78									
Loss of Self Consciousness	Imagery	14.27	2.15	16.27	2.64	.36	.55	.01	12.04	.002	.33	.61	.44	.02
	Video	15.20	3.21	16.46	2.29									
Transformation of Time	Imagery	15.00	2.57	17.81	1.16	2.21	.15	.08	39.62	<.001*	.62	.17	.68	.007
	Video	13.93	2.73	16.40	2.41									
Autotelic Experience	Imagery	15.81	2.44	17.91	1.30	.45	.51	.02	35.35	<.001*	.59	1.38	.25	.05
	Video	16.66	2.49	18.06	1.57									

Basketball Shooting Performance

To examine the effect of the Imagery and Video conditions on shooting performance from pre-test to post-test, I used Two-Way, Mixed-design ANOVAs. I compared performance on 2-point, 3-point, and total shooting score between conditions on two occasions (pre-test, post-test).

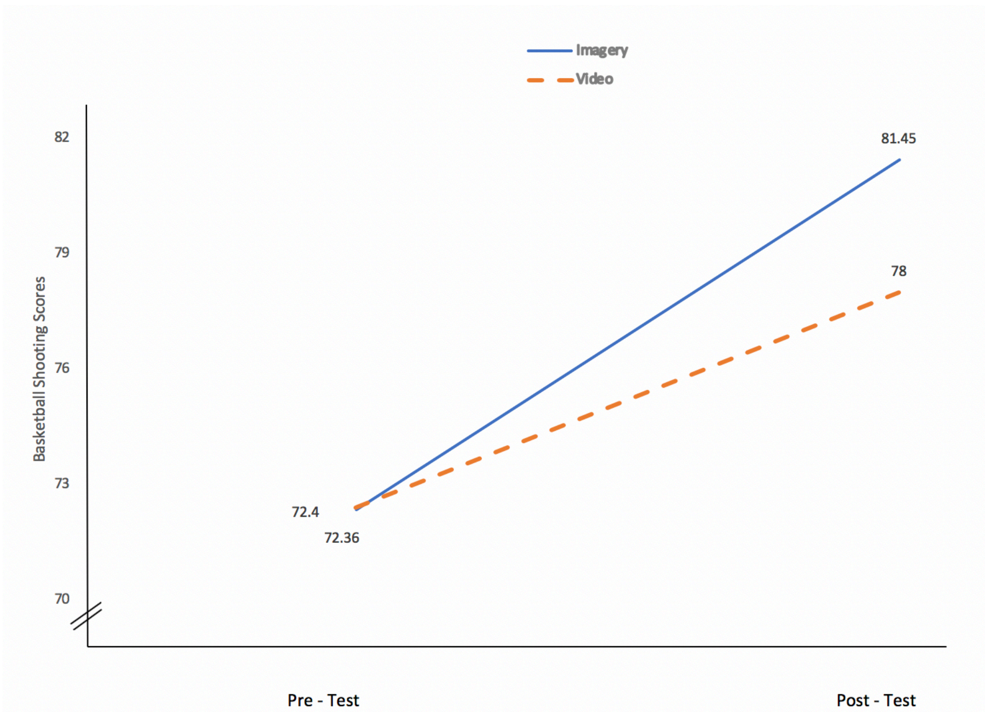

Figure 3.12. Mean 2-point shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 3.12 shows the means for 2-point shooting performance for the Imagery and Video intervention conditions and occasions. The graph lines indicate that participants in both conditions improved their performance from pre-test to post-test. The Imagery and Video conditions had very similar means at pre-test, but the mean for the Imagery intervention condition increased more by post-test than the Video condition mean, as reflected in a steeper slope. I conducted a Two-Way, Mixed-design ANOVA to compare the 2-point shooting score differences between conditions on different occasions. Analysis revealed no significant condition main effect, a significant main effect of occasion ($p < .001$), with a very large effect size, and no significant interaction effect (See Table 3.3). Participants in the whole sample improved their 2-point shooting significantly from pre-test to post-test.

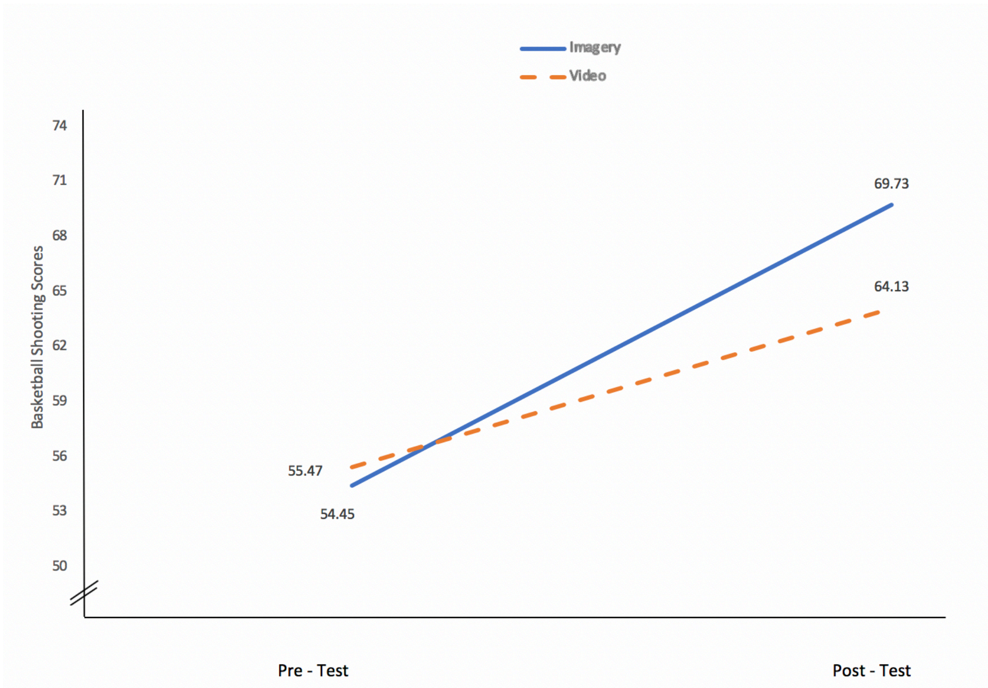

Figure 3.13. Mean 3-point shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 3.13 shows the means for 3-point shooting performance for the Imagery and Video intervention conditions and occasions. Both conditions depicted increases from pre-test to post-test, with a steeper slope for the Imagery condition. I conducted a Two-Way, Mixed-design ANOVA to compare the 3-point shooting score differences between conditions on different occasions. Analysis revealed no significant condition main effect, a significant main effect of occasion ($p < .001$), with a very large effect size, and no significant interaction effect. Participants in the whole sample improved their 3-point shooting significantly from pre-test to post-test.

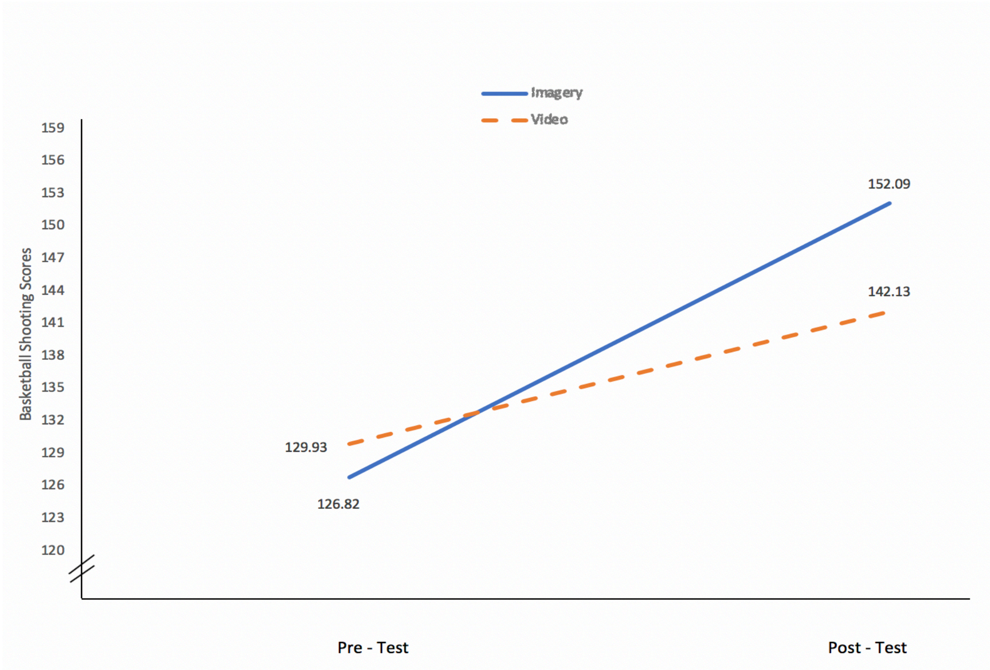

Figure 3.14. Mean total shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 3.14 shows the means for total shooting performance for the Imagery and Video intervention conditions and occasions. Both conditions showed an increase in performance from pre-test to post-test. The increase was greater for the Imagery intervention condition than for the Video condition, as reflected in a steeper slope, and there was a crossover between pre-test and post-test, suggestive of a disordinal interaction. I compared the means of the total shooting scores, that is the 2-point scores plus the 3-point scores, for conditions and occasions, using a Two-Way, Mixed-design ANOVA. Analysis showed no significant condition main effect, a significant main effect of occasion ($p < .001$), with a very large effect size, and a significant interaction effect ($p < .001$), with a large effect size. As indicated by the significant conditions x occasions interaction effect, participants in the Imagery condition improved their total shooting significantly more than those in the Video condition. This probably contributed to the significant main effect of occasion.

The means and SDs for 2- and 3-point shooting performance, and total shooting performance for the Imagery intervention condition and the Video condition are presented in Table 3.3, along with the *F, p, and* η^2 *Va*lues for the condition main effect, the main effect of occasion, and the interaction effect for each shooting performance comparison.

Table 3.3.

Means, and Standard Deviations, F, p, and η^2 *Values for Shooting Performance for Each Intervention Condition and Occasion (Pre-test and Post-test)*

Flow Subscales	Condition	Pre - Test		Post -Test		Condition			Occasion			Interaction		
		M	SD	M	SD	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
2 -Point	Imagery	72.36	10.85	81.45	7.95	.26	.61	.01	26.89	<.001*	.53	1.52	.23	.06
	Video	72.40	9.38	78.00	8.32									
3 -Point	Imagery	54.45	12.77	69.73	12.23	.36	.55	.01	46.39	<.001*	.66	3.53	.07	.13
	Video	55.47	9.67	64.13	7.83									
Total	Imagery	126.82	18.67	152.09	17.52	.35	.56	.01	164.69	<.001*	.87	20.04	<.001*	.45
	Video	129.93	12.84	142.13	11.97									

Debriefing Interviews

The 11 people who participated in the Imagery intervention reported on their experiences during the study in brief social validation interviews that I interpreted impressionistically (Jackson & Eklund, 2002). Participants attended six sessions over two weeks then explained their experiences during the imagery sessions, including the effect of imagery on flow experience and the effect of imagery on performance. Most participants' experiences of flow during the imagery sessions varied. For some participants, the feeling was really positive with a sense of completing the shots perfectly and fluently without feeling weakness. In addition, during their experience of imagery sessions of performance, their experience was new to them, they greatly enjoyed this experience, and they thought it could also be helpful for other sport performances besides those involving basketball. They had never thought before about how influential the effect of imagery could be. On the other hand, participants felt that they had never experienced scripts before; they had always tried to imagine the games and performance before this program, but apart from a few participants, most had found it impossible to think about some aspects. Thus, structured imagery scripts appeared to help participants to focus on their imagery and experience positive effects.

Results of the interviews showed that participants in Imagery the intervention used this technique to help them learn and practice skills to improve performance, to help them be more creative, and to manage their emotions and motivation, so that they were able to improve their shooting performance. Participants reported that the Imagery intervention was associated with an increase in flow experience, specifically for C-S balance, clear goals, and unambiguous feedback, which were the three antecedents flow state dimensions targeted by the imagery intervention. This is consistent with the quantitative results, which revealed significant interaction effects favoring the imagery intervention for those three flow state dimensions.

The 15 participants in the Video condition experienced enjoyment when they watched the expert basketball players' shooting skills. They said that after they attended the program, they felt like they could perform the shooting skills in the same way as the expert basketball players they had watched in the videos. For example, most participants in the Video condition felt like the performance was good, and it was exciting to watch highly-skilled players playing the game and observe their high-quality shooting performance. They tried to learn how the players performed the skills specifically, how they achieved the goals of shooting from different locations. When the participants were watching the video during their video condition sessions, they found that the flow experience was aesthetically pleasing especially when they were concentrating on the slow movement of a player and how they shot the ball. Some people felt like they improved during that time because they were learning. Moreover, participants experienced 'imagery of performance' during the video condition sessions, in such a way that they wished that they could do the same as those players did on the court. Furthermore, when they were actually playing in a game, they would imagine how the professionals would do it and try to follow the professional players' action and movement. They also had some reflections after completing the video condition, such as a realisation of the importance of training more. However, some participants did not really enjoy the video because they depicted high-level performance. They felt they did not have enough skill to deliver the task in the same way as the players in the video, or they thought that watching the video alone could not give much idea of what they had to do to improve their performance of basketball shooting. Thus, some insight from these interviews helps to explain how participants in the Video condition experienced their involvement in this study. It also offers some reflections. Participants gave indications that they found watching the video useful for improving their shooting skills and they also stated that their involvement increased their flow experience.

Discussion

The aim of this study was to examine whether the imagery of goal-setting and feedback related to a sports task promotes clear goals and unambiguous feedback, enhances global flow state targeted flow state dimensions, and facilitates sports performance in a context where challenge matches skills for the task, that is, there is C-S balance. I predicted that the three targeted flow dimensions of C-S balance, clear goals, and unambiguous feedback, and basketball shooting performance would increase significantly more from pre- to post-test in the Imagery intervention condition than in the Video Placebo intervention condition. This was because the imagery script was designed specifically to promote C-S balance by setting clear goals that were based on matching individual participants' skills with the challenge. In addition, the imagery script included instructions to imagine gaining clear feedback that performance was successful. Flow experience was measured with the Flow State Scale-2 (FSS-2) and Two-Way, Mixed-design ANOVA models were used to test for the main effects of the research conditions, changes from pre-test to post-test, and the interaction effect of the conditions and occasions on all nine flow dimensions, as well as global flow state. The discussion is divided into three sections. First, I consider explanations of the effects on the three selected antecedent dimensions of flow. Following this, I discuss effects on the other six dimensions of flow that were not targeted in this C-S balance, goal setting, and unambiguous feedback study. In the next part of the discussion, I address the basketball shooting performance of participants during the study. Then, I reflect on methodological issues raised by this study, including limitations. I follow this by proposing research to examine further the use of imagery to promote C-S balance, clear goals, and unambiguous feedback to enhance global flow state, flow dimensions, and performance.

Effects on Three Targeted Flow Antecedents

A key emphasis was placed on three antecedent flow dimensions, C-S balance, clear goals, and unambiguous feedback, in order to promote flow experience and increase shooting performance in basketball. The results for the targeted participants in the Imagery intervention condition supported the prediction, as the Imagery intervention showed a significantly higher impact from pre-test to post-test than the Video intervention condition on the targeted flow dimensions of C-S balance, clear goals, and unambiguous feedback. For participants to have clear goals, they need to have a strong awareness of what they are doing, which gives athletes a sense of direction as to where they are headed. Goal setting can be defined simply as a process in which realistic, attainable targets are set and effort is directed to achieving those targets (Swann et al., 2016).

Stavrou et al. (2015) examined the relationship between flow experience and goal orientation theory (Nicholls, 1984,1989). The sample of 272 participants in 7 individual sports (track and field, swimming, shooting, archery, tae-kwon-do, skiing, cycling, table-tennis, canoe-kayak, & fencing) completed the Task and Ego Orientation in Sport Questionnaire (Duda, 1989) and the Flow State Scale-2 (Jackson & Eklund, 2002) after athletes' took part in a 30-minute competition at national and international levels. The results indicated that the athletes' task orientation might be a critical factor for achieving flow in competitive sport, feeling they produced a high level of performance and judging that the competition was challenging Stavrou et al. (2015). To relate these studies and their findings to the basketball players in the present study, the Imagery intervention featuring clear goals was associated with experience of a greater intensity of flow than that in the Video condition, and participants in the Imagery condition specifically experienced higher levels of the clear goals flow state dimension than those in the Video condition at post-test.

Stein, Kimiecik, Daniels, and Jackson (1995) studied mental antecedents of flow in recreational sport. In the three studies that, they conducted three potential psychological antecedents of flow were focused on. These were goals, competence, and confidence. The results of the studies suggested that contextual differences influence why athletes perceive a situation as being optimal. The psychological antecedents of flow for sport participants were not identified in the Stein et al. study, because neither goals, competence, nor confidence were successful in predicting experiences of flow. In the present study, all three targeted flow dimensions, C-S balance, clear goals, and unambiguous feedback, increased significantly in the Imagery intervention condition from per to post intervention. This was the key finding of this study, which supported the primary hypothesis. It is possible that this study produced more clear-cut effects on imagery intervention because imagery has been widely reported to be a powerful intervention technique in sport (Stein et al., 1995). Koehn et al. (2013) also showed that imagery can be a major factor in improving flow. In their study, they focused on using Cognitive Specific, Cognitive General, and Motivational General-Mastery types of imagery in order to facilitate flow. The results of their single-case design study showed that nationally-ranked junior tennis players increased their global flow state in ranking competitions in the Imagery Intervention Phase compared to the Baseline Phase.

There are several reasons why imagery can facilitate flow. Imagery training can help athletes to become clear and focused on their goals through repeatedly rehearsing the process of performing is also important with those goals in mind and imagining the final outcome in which they attain those goals. Importantly, this leads to feedback of success in the imagery process. Paivio (1985) suggested that imagery can help to motivate athletes as well as teach them arousal and emotional control. In addition, the flow model assumes that flow is experienced when challenges and skills match. When there is a mismatch and challenges are too demanding for individual skills, then worry and anxiety will result and individuals will not experience flow. The relationship between challenge and skill is the basis of the flow model. It is important to point out that challenges are seen as opportunities for action and skill as action capabilities (Csikszentmihalyi, 1975). Thus, it can be proposed that the imagery script employed in the present study, which combined a focus on the three important and related flow dimensions of C-S balance, clear goals, and unambiguous feedback, provided a powerful combination of content to enhance the corresponding three flow state dimensions.

Effect of Imagery on Non-targeted Flow Dimensions

The results presented for the non-targeted flow dimensions, namely merging of action awareness, concentration on the task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience, showed significant differences in terms of the main effects of occasion. The graphs also show that both experimental conditions have relatively steep slopes. As predicted, there was no significant difference between the interventions in terms of increasing these flow dimensions from pre-test to post-test. However, Jackson and Csikszentmihalyi (1999) stated that "Athletes who perform at their best in a game frequently report a mental state in which they are very focused and absorbed in the activity. They have a great sense of control while mind and body are as one. This mental state is not only great for performance, it also helps with the internal motivation in feeling joyful and wanting to do more of it." (p. 20). This is a possible reason why the six flow dimensions that I did not target in the

Imagery intervention in this study showed increases for both the Imagery intervention and the Video Placebo intervention conditions from pre-test to post-test.

The Video condition in the study provided participants with information related to the shooting techniques used by experts. Participants in the Video condition observed information from watching the experts shoot and learned from watching a different video in each session. Additionally, music was added to the videos. The Video condition was designed to be as interesting as possible for participants in this study, so they could really enjoy participating in the sessions. I suggest that these factors contributed to the enhanced results on the FSS-2. Kimiecik and Stein (1992) reported that being task-involved should enable athletes to focus more on the task at hand, thereby increasing their ability to get absorbed in an activity. This could lead to the experience of flow characteristics (i.e., enjoyment of the activity), higher levels of concentration, and athletes feeling in control. According to Csikszentmihalyi (2000), there are many activities that can promote the chances of flow experience occurring. Maybe it is for this reason that the Video intervention had a positive impact on all nine flow dimensions in the present study. Csikszentmihalyi and Jackson (2000) gathered ESM responses from a sample of more than 800 U.S. adolescents aged 11 to 18 years old. Csikszentmihalyi et al. showed that sport, in particular, is associated with a number of very positive qualities. Privette (1983) suggested that peak experiences did not necessarily occur as a result of participation in a specific activity, whereas individuals could be in a passive mode, which may occur in inactive or non-motivated states in everyday life, such as listening to a radio or music, watching television, or forms of intoxication. On the other hand, flow experience and peak performance reflect the active nature of the physical or mental immersion in planned and structured activities as characterized by cognitive involvement, interactivity, and responsiveness between athletes and their environments (Privette, 1983). Thus, the flow antecedent Imagery intervention in this study might have affected flow experience that relates to the six non-targeted dimensions being enhanced. It is possible that participants in the Video condition used spontaneous imagery (Cumming, J., & Williams, S. E., 2013) prior to performance during the study. These comments suggest that some participants in the Video condition did this. However, it is equally, or perhaps even more, likely that participants used spontaneous imagery, given that they were explicitly trained to use imagery during the study.

Although, participants in the Video intervention condition had as well as extra training experience. This may have assisted those participants when faced with challenging situations. As the demographic data show, the playing experience and competition experience of basketball players in the Video condition averaged two years longer than it did for those in the Imagery condition with a mean of more than 10 years (M = 10.13). I was experienced that individuals who had many years of experience in playing basketball knew how to change the balance of challenges and skills in order to increase the chances of flow occurring. According to Csikszentmihalyi (2000), in order to experience flow, it is not enough for challenges to equal skills; both factors need to extend the person, stretching them to new levels. Athletes often find themselves in challenging situations; indeed, sport is about putting the physical body to the test and making the test conditions progressively more difficult. Challenges in sport come in a variety of forms, including physical, mental, and technical. Hence, self-generated challenges stimulated by watching experts shooting might have been effective in increasing flow experience in participants in the Video condition.

Shooting Performance

The script in the Imagery intervention condition instructed each participant to imagine shooting baskets from around the basketball ring at 2-point and 3-point distances and angles of 90, 60, and 30 degrees from the end line of the court, and with a success rate commensurate with the goal set by that participant. I predicted that imagery of this process would result in an improvement in performance. In the basketball shooting performance pre-test and post-test, participants were asked to take 80 shots from the five angles around the key at two locations, one in the 2-point and the other in the 3-point range, as in their imagery. Examination of the means for pre-test and post-test in both the flow Imagery and the Video condition indicated that all means increased substantially from pre-test to post-test, as would be expected. The means for 3-point shooting were lower than the means for 2-point shooting at pre-test and post-test, as would be expected because 3-point shooting is a more challenging task. As an outcome of the Imagery intervention, performance increased more from pre-test to post-test for 3-point shooting, rather than for 2-point shooting. This was especially noticeable for the Imagery condition. Two-Way, Mixed-design ANOVAs indicated that both conditions showed significant differences across occasions and for the conditions x occasions interaction. The prediction for shooting performance was that participants who were placed in the Imagery condition would experience a significantly greater improvement in their 2-point, 3-point, and total shooting performance from pre- to post-test than would those in the Video condition. After analysis of this study, it was evident that the results from the Imagery condition followed the prediction on total shooting scores because shooting performance of the Imagery condition increased from the pre-test to the post-test more than shooting performance in the Video condition. Furthermore, mean shooting performance in the Imagery condition increased by a larger margin than in the Video condition, reflected in the significant interaction effect. In addition, this study showed that the Imagery condition participants had a higher mean for their 3-point shooting performance than the Video condition participants who watched basketball shooting skill videos.

Cutrone (1998) showed a similar effect of the imagery intervention to promoted performance in basketball. The studied using goal setting and imagery skill for improving youth basketball players' performance. The results of that study supported the hypothesis that the utilisation of an intervention package, consisting of goal setting and imagery, would improve the defensive skill performance of youth-aged basketball players in actual game situations. Vealey and Walter (1994) stated that athletes can use imagery to replay previous performances and set goals for improvement based on these past performances. Imagery be useful for "goal programming", which involves using imagery to "program" goals by repeatedly imagining the achievement of goals in both practice and competition. In a task like basketball shooting, this may lead to enhancement in shooting accuracy. Overall, these training programs (goal setting and imagery) allow athletes to become more aware of their strengths and weaknesses, thus, help them to devise the best strategies for improvement. I gave participants one negative instruction during the imagery condition, which was not to think about negative outcomes. Beilock, Afremow, Rabe, & Carr (2001) reported that suppressive imagery can be debilitating to performance. The increases in performance observed in the Imagery condition at post-test indicate that the imagery script was effective. Perhaps participants in the Imagery condition would have achieved an even larger improvement in performance, if I had instructed them to think only of positive outcomes.

The Video condition was intended to be an attention placebo condition, that is, participants received the same amount of attention doing something that appeared to be related to their basketball shooting performance, but, in fact, it was expected that the Video intervention would have no effect on performance. Nonetheless, shooting performance in the Video condition significantly increased after participants had completed two weeks of the intervention. This result suggests that video modelling can be used as a tool to improve flow experience and increase performance. Perry and Morris (1995) proposed that one of the techniques used in sport psychology to enhance imagery rehearsal and athletic performance is video modelling, which involves the observation of a model or expert performer executing a specific skill successfully. Video modelling involves replaying a video of an expert, for example, a skilled basketball performer, which allows athletes to view a skill being performed correctly and creates a mental representation of the correct skill in their minds, so that they can physically model or image it. The Video condition in the present study represents an illustration of how successful performance in a sport situation can be used as a mental representation of correct skills and resultant success, when individuals perform imagery (Morris et al., 2005). Schmidt (1975) on the other hand, suggested using schema theory, where both correct and incorrect movements can facilitate the learning process. According to Smith and Holmes (2004), participants in imagery and video modelling interventions were more successful at generating the images required and significantly improved their sporting performance compared with those who only used imagery scripts. Moreover, McCullagh and Weiss (2001) stated, from watching others perform, a cognitive representation is formed that both initiates subsequent responses and serves as a reference to determine the correctness of these responses. In addition, it has been demonstrated that imagery and modelling interventions can be effective tools for enhancing performance even when athletes only employ the interventions for one session (Cumming & Ramsey, 2008; Czech, Joyner, Munkasy, & Lachowetz, 2008; O & Munroe-Chandler, 2008). Thus, it is possible that, although athletes were not given an active imagery intervention, participants in the Video condition in the present study improved their performance due to incidental observational learning or video modelling.

The Video condition included arousing music that might also have facilitated the development of shooting performance during the 15-minute sessions over the two weeks. This music might also have been beneficial to flow experience. Several researchers have explored ways in which music may aid the mind when learning or enhancing a process or skill. Kuan (2014) found that different types of music played during imagery away from performance subsequently lead to increased pistol-shooting, dart-throwing, and weight-lifting performance. He reported the biggest effects for relaxing, unfamiliar classical music. Pain, Harwood, and Anderson (2011) studied the impact of pre-competition imagery and music on flow and performance in competitive soccer. Their results indicated that when combined, asynchronous music and motivational general-mastery imagery had a facilitative effect on flow and perceived performance. Suggestions and comments from players supported the intervention strategy and showed great potential for its use by athletes during pre-competition training. Pates, Karageorghis, Fryer, and Maynard (2003) researched the effects of asynchronous music on flow states and shooting performance among netball players. The results showed that two of the participants experienced an increase in the perception of flow, whereas all three participants improved their netball shooting performance. In addition, participants indicated that the intervention helped them to control both the emotions and cognitions that impacted upon their performance. In the present study, it is possible that music had an effect in the Video condition that was independent of the observational learning effect on performance or that music interacted in some way with the learning effect.

Methodological Issues and Limitation

I noted a number of possible methodological issues in this study. One major concern I identified was problems regarding participants who were not interest in the imagery process and did not have confidence that imagery could be beneficial for their performance. As a consequence, four participants were not motivated to complete the Imagery intervention and I had to exclude them from analyses. Thus, only 11 basketball players, from the 15 players who started the study, were retained in the Imagery condition for analysis, whereas all 15 basketball players remained in the Video condition. I excluded the participants from the study on the basis of their comments during the debriefing interviews. In those brief interviews, these four participants voiced concerns about the demands of busy schedules, having poor motivation, and issues of not experiencing any impact of the imagery in the one or two sessions that they completed. In addition, those original participants were not interested in the content of the six imagery sessions. The exclusion of these participants did not appear to have a noteworthy effect on the results. Significant effects were still observed for the Imagery condition, whereas I retained the full complement of 15 participants in the Video condition because they expressed interest in the videos and reported completing all six sessions. Power analysis with a significance level of .05, a large effect size, and power of 70% indicated that a sample of 30 participants would be needed. Thus, it would be valuable to replicate the present study with a larger sample.

An issue that might have influenced all participants in the imagery condition, but, in particular, could have affected the behaviour of the four participants who did not complete all the imagery sessions is the absence of a standard introduction. In previous research and practice with imagery, it has been observed that the motivation and commitment of athletes to perform imagery is affected by their belief that imagery is an effective technique (Morris et al., 2005). Practitioners have developed techniques to give athletes confidence in the efficacy of imagery training. Weinberg and Gould (2010) proposed a 3-step process for the delivery of psychological skills training (PST), consisting of Education, Acquisition, and Performance phases. In the case of imagery interventions, like the one in this study, the introduction, in which participants are informed about the use and effectiveness of imagery interventions to enhance sport performance and psychological variables, corresponds to the Education phase. It is an important part of the imagery intervention because it informs participants that research and elite athletes' experience shows that imagery does work, provided it is done regularly, which motivates individuals to perform all the assigned imagery sessions diligently. These include clarifying the difference between the often random and uncontrolled occurrences of imagery everyone experiences and the systematic rehearsal of imagery of correct performance, personal testament to the effectiveness of imagery training by elite athletes, such as multiple Open Championship-winning golfer Jack Nicklaus and Olympic gold medal-winning diver Greg Louganis, and demonstrations of effective imagery, such as the arm-like-iron-bar and the string-and-bolt effects. Most researchers include in imagery studies an introduction that makes the first two points and demonstrates the third, even encouraging potential participants to experience one of the demonstrations. Without this introduction the risk of participants reporting lack of interest and non-adherence to imagery protocols is increased substantially and might negatively affect those who do adhere to the imagery-training schedule. In future studies, I recommend that researchers include such an introduction.

Another methodological issue was associated with the terminology used to describe flow experience on the nine flow dimensions. There is a suggestion that some participants did not understand the FSS-2 questions. In the debriefing interviews, a number of participants commented that they confused several of the questions in the FSS-2. They thought the questionnaire asked for ratings on the same phenomenon. In addition, when I interviewed participants, I found that some came from different countries and English was not their first language. In future research, I recommend that researchers provide an explanation and ensure that participants understand the terms used to describe flow dimensions.

It is clear that imagery of successful performance, as presented in the imagery script in the present study in the form of imagining achieving clear, challenging, but attainable goals, can enhance performance. Thus, sport psychologists have more evidence supporting this kind of imagery intervention in their work in sport. It is also evident that the dimensions of flow remain somewhat unpredictable and uncontrollable. The C-S balance, clear goals, and unambiguous feedback targeted flow dimensions behaved as intended, whereas some non-targeted flow dimensions increased in the Imagery and Video interventions and together might be argued to reflect an increase in global flow state. It is possible that increasing global flow in this way is the most that practitioners can do, while researchers discover the more intricate secrets of flow dimensions.

It might be suggested that the final sample size was rather small for revealing clear-cut significant effects. However, there were some convincing significant differences for certain flow dimensions. They were just not only the ones I predicted and some occurred in what was intended to be a placebo condition. The sample size also produced clear and strong performance results that showed an effect for both the Imagery and the Video condition. However, the improvement in performance from pre-test to post-test was stronger in the Imagery condition, as expected. Further, there seems to be a plausible reason for the increases observed in the Video condition, that is, incidental, observational learning. This did confound the results to some extent. It is recommended that expert shooting should not be considered as an effective attention placebo condition in future research on basketball shooting.

It is also possible that there were not sufficient sessions. There are two ways to increase the total number of sessions. One is to increase the number of sessions per week. The other is to increase the number of weeks in the imagery program. Wakefield and Smith (2011) found that three sessions of imagery per week was significantly more effective than one or two sessions per week. This suggests that the three sessions per week employed in the present study was adequate. It is likely that more weeks of the intervention could have an impact on the pattern of results. Many studies of imagery training have included three to six weeks of imagery sessions (Munroe-Chandler et al., 2012; Smith et al., 2007). Again though, the significant results that arose in the present study belie this argument. Perhaps two weeks of three sessions per week is adequate, but additional weeks would make results more clear-cut and increase confidence in them.

Arguably the most pertinent limitation was the choice of video as a placebo control condition, given the strong research base on the effectiveness of video modelling as a performance enhancement technique. However, the video was not designed for modelling and participants in this condition were given no instructions. It was simply intended that they would relax and enjoy watching elite basketball players shooting. In future studies on basketball shooting, I recommend placebo conditions should consist of video of general game play with no shooting.

Further Research

In the present study, the aim was to examine the role of imagery as an intervention to influence specific flow antecedents. I argued that linking C-S balance and unambiguous feedback through the creation of clear goals that represented a suitable challenge depended on each participant's shooting skill. Thus, I set participants' goals on the basis of their individual pre-test performance to create a challenge that would extend their skills and give them clear feedback as they performed the imagery sessions. It is possible that this combination was more elaborate than it needed to be. Thus, studies should be conducted in which each single flow dimension is the target of a carefully researched and prepared imagery script. Studies could be conducted in which one flow state dimension, C-S balance, or clear goals, or unambiguous feedback, is compared with the combination of three flow dimensions examined in the present study. It would also be possible to conduct studies in which imagery scripts including two of these three flow dimensions, that is, C-S balance and clear goals, C-S balance and unambiguous feedback, and clear goals and unambiguous feedback, are compared with single flow dimension imagery scripts. A program of studies with this design would help to clarify whether combining these flow dimensions produces significantly larger increases in the corresponding flow state dimensions and global flow state on the FSS-2 than can be achieved with imagery scripts that focus on one of these flow dimensions or specific pairs of dimensions. These studies would help identify the most efficient imagery script content to enhance global flow state and the flow state dimensions of C-S balance, clear goals, and unambiguous feedback.

Focusing more closely on a specific aspect of the studies proposed in the previous point, Csikszentmihalyi (1975; 1990) has proposed that C-S balance, in which the challenge extends the skill level of athletes, is the essential foundation for a flow state to occur. In this study, findings reflect the potential for further research on use of imagery to promote the three antecedents of flow state to increase flow experience and basketball shooting performance. However, it is not clear whether the key flow dimension to focus on is C-S balance or whether, as argued in the Introduction to this chapter, C-S balance is determined by setting appropriate goals. The research findings from Study 1, in which an imagery intervention combined the three antecedents of flow, C-S balance, clear goals, and unambiguous feedback, showed that the key element of the imagery script was setting clear goals. Thus, similar studies to the present one should specifically examine whether the imagery training would be as effective if it focused only on clear goals because if the goals are appropriate, they will set up a C-S balance and it will be clear what outcome is expected, so feedback should be unambiguous. Perhaps a more clear-cut way to examine this would be to conduct studies comparing a condition in which imagery focused on C-S balance only, with no reference to clear goals, with a condition in which clear goals are the focus, with no content that refers to C-S balance.

The vast majority of previous quantitative research on flow state has used global flow state as the main indicator of flow. Global flow state presents a mean representing a conglomerate of scores on nine flow dimensions that reflect diverse phenomena. Many combinations of different levels of these nine flow state dimensions can lead to exactly the same score on global flow state (e.g., Jackson et al., 2008; Koehn et al., 2013; Pates et al.,2003; Stavrou et al., 2015). In the present study, I examined flow antecedents dimensions based on Stavrou and Zervas' (2004) proposal, I predicted that administering an imagery intervention to enhance clear goals in a way that creates a C-S balance, providing the opportunity to gain unambiguous feedback should lead to increases in the measures of those three targeted interventions in the FSS-2, as well as increases in global flow state. In addition, I reported results for global flow state and all nine flow state dimensions in this study. The results showed increases in flow in the Imagery intervention or the Imagery and the Video interventions for global flow state and all the flow dimensions. The results of this study, thus, suggest that the impact of interventions, targeted to affect specific flow dimensions, could have a more generalized effect on all the flow dimensions, as well as global flow state. Understanding whether there are complex interactions between flow state dimensions, in which changes in some flow dimensions trigger changes in other flow dimensions, or whether interventions, based on techniques like imagery, affect different flow dimensions independently, requires research that analyses the flow dimensions separately. At least initially, this is not a measurement issue. The flow dimensions have been measured in almost all published quantitative research, which has employed the FSS-2 as the measure of flow. It is an analysis issue, which involves examining the subscale scores for the nine flow dimensions separately, as I have done here.

Results for performance were clear. Both interventions enhanced performance. I propose that this occurred through different mechanisms. The effect for the Video condition, which was unintended in the research design, appeared to be due to observational learning or modelling, in which participants, either intentionally or unconsciously, learnt aspects of basketball shooting by watching the videos of elite players performing successful shots. Watching experts perform might also have motivated participants in this condition. This suggests that there is potential for further research in which intentional video modelling is the active intervention. Although video modelling has been examined in research (Khan, 2014), I am not aware of research examining the impact of video modelling on the experience of flow.

The impact of the Imagery intervention on flow state was probably associated with imagery of performing successful basketball shooting. This could have at least two effects. First, imagery of the technique used in shooting could have led to improvement in the process of basketball shooting. Second, observing successful outcomes could have increased participants' confidence in their basketball shooting. In previous research, both of these effects, improvement in technique (Fazel et al., 2018) and increase in confidence (Koehn, 2013) have been widely supported. Further examination of the relative impact of technique improvements and increasing confidence could be examined. One way to do this would be to include an imagery condition in studies in which correct technique is imagined, but imagery stops before the outcome of the sport task (e.g., basketball shooting, golf putting, and pistol shooting). Exclusion of the outcome would minimize the effect of the imagery intervention on confidence, while maintaining its impact on technique. Comparison with a condition that included outcome of the task as well as the process should determine the extent to which confidence plays a role on the success of typical imagery training that includes both process and outcome. This kind of study design would be difficult to implement in imagery and flow studies that include unambiguous feedback in the imagery script.

Conclusion

The significance of this study was that I sought to determine ways to enhance the psychological antecedents of flow and examine how this leads to increases in the experience of flow in sports contexts, as well as what effect it has on performance of basketball shooting. I tested the proposition that this could be done effectively by using an Imagery intervention on goal setting, related to establishment of a C-S balance and leading to unambiguous feedback. This study increased understanding of ways to promote flow and facilitate performance that can be replicated in many sports and other high-performance tasks. Enhancing the occurrence and intensity of the positive psychological state of flow is an important goal for athletes, coaches, and sport psychologists alike.

The findings on flow included increases for global flow state and all nine flow state dimensions following the flow Imagery intervention. The nine dimensions significantly increased from pre-test to post-test for the Imagery and Video intervention conditions.

Importantly, the three targeted dimensions, C-S balance, clear goals, and unambiguous feedback increased significantly more for the Imagery intervention than the Video intervention. The effects of the imagery intervention for those three flow dimensions are consistent with the predictions I made. However, significant increases from pre-test to post-test for the whole sample on the other six flow dimensions are more difficult to reconcile with the intended effects of the interventions. It is possible that participants in the Video intervention being dedicated basketball players related to the elite shooters in the videos they watched and consequently achieved a heightened sense of flow, becoming immersed in the outstanding shooting they observed.

Regarding antecedents and concomitants, I based the flow Imagery intervention on the proposition that five flow dimensions are antecedents of flow and four are concomitants. I expected that the Imagery intervention would promote challenge-skill balance, clear goals, and unambiguous feedback because I designed it to focus on them, but not the other two antecedents or any of the concomitants. I found that the Imagery intervention was associated with increases in all three targeted dimensions, and also the other six flow dimensions increased significantly. However, the Video condition intervention was intended to be just an attention placebo condition. This combination of predicted and unexpected outcomes suggests that further exploration is needed to understand the nature of flow dimensions as antecedents and concomitants of flow.

Scores for 2-point, 3-point, and total shooting increased significantly in the Imagery intervention; this was especially the case for 3-point shooting. In the Imagery intervention it is possible that elements of the intervention that were related to imagining performing shooting produced a substantial influence on performance. It is also possible that the increases in flow, although not consistent across all nine flow dimensions, were associated with increases in performance. However, 2-point shooting performance in the Video condition increased significantly from pre-test to post-test for the whole sample, which might have been a result of incidental observational learning. There is substantial evidence that video modelling is an effective skill enhancement technique in its own right and it is possible that this could have happened incidentally, that is, even when I made no attempt to use the video intervention in this way (Khan, 2014). It is plausible that imagery and video modelling independently demonstrated their efficacy in the sports performance enhancement domain. It is important to point that the main conclusion of this study is that the imagery script, designed to create a combined effect of three antecedents of flow, namely C-S balance, clear goals, and unambiguous feedback, did appear to produce a powerful combination of content to enhance the corresponding flow state dimensions and increase shooting performance.

CHAPTER 4

STUDY 2: THE EFFECTS OF A CONCENTRATION IMAGERY INTERVENTION TO ENHANCE FLOW EXPERIENCE AND INCREASE SHOOTING PERFORMANCE

Introduction

Flow is both a positive and peak experience, related to total concentration, calmness, and confidence (Koehn, 2013). Flow is the feeling athletes get when they are totally absorbed in their sport, whether in training or competition. When players experience flow they may, for example, find basketball highly enjoyable and want to continue playing. Such high levels of enjoyment constitute intrinsic motivation related to wanting to do more training, to practise more regularly, and to compete more often, simply for the pleasure and satisfaction of playing (Csikszentmihalyi, 2014). Training and competing more, especially with a sense of enjoyment, often leads to improved performance. Because increasing enjoyment, motivation, and performance are benefits for athletes, it is important to promote flow, so that it occurs as frequently as possible. As athletes and coaches know very well, it is difficult to produce peak performance when the mind is not focused. In this thesis, I study imagery techniques that can help players to experience flow based on the proposition that certain flow state dimensions represent antecedents of the flow experience (Stavrou & Zervas, 2004). Such imagery could also lead to improved basketball shooting performance. In this study, the specific purpose was to examine the use of imagery to enhance total concentration in order to increase the experience of flow states and to examine how this affects the shooting performance of basketball players.

Method

Participants

The sample size was determined from a power analysis for ANOVA in which the numerator was 1, the significance level was .05, the effect size was large (.80; Cohen, 1988) and the power was 80%. A large effect size was determined to be appropriate from previous research on flow in sport (Faul, Erdfelder, Lang, & Buchner, 2009). Based on a power analysis with significance level set at .05, large effect size and power of 70%, participants were 30 basketball players (18 male, 12 female) from a Melbourne local league competition, who volunteered to participate that is a completely unique sample (no overlap from study 1). All the players who volunteered for this study met the inclusion criteria, so there were no volunteers who were excluded. I randomly assigned players to the Imagery and Video conditions. The mean age of the basketball players who participated in the study was 26.36 years (*SD* = 7.16). The mean age of the participants in the Imagery condition (*n* = 15) was 29.26 years (*SD* = 7.23), and the mean age of the participants in the Video condition (*n* = 15) was 23.46 years (*SD* = 5.98). Participants in the Imagery condition had 9.46 years (*SD* = 6.01) of playing experience in competitive basketball, whilst those in the Video condition had 6.26 years (*SD* = 4.39) of playing experience. The participants undertook three sessions of regular basketball training per week. Those in the Imagery condition spent 7.66 hours per week training, compared to 3.66 hours per week for the Video condition participants. The Imagery condition participants in this study played in Divisions A, B, and C of the basketball league and the Video condition participants played in the same Divisions A, B, and C.

Study Design

All three studies in this thesis used the same overall pre-test, intervention, post-test design and measures. After completing the SIAM (Watt et al., 2004) to screen for moderate to high imagery ability, participants completed the basketball shooting task and the FSS-2 (Jackson & Eklund, 2002) at pre-test. The Imagery intervention conditions varied in content from study to study, depending on the flow dimension(s) targeted in that study. Here the imagery focused on promoting total concentration on the task. The Video control condition was modified in this study because of the incidental, observational learning effect that appeared to arise in Study 1 after watching elite players shooting. I matched participants into pairs based on the team they played for and the position that they played. Then I assigned one member of each pair at random to the Imagery condition and I assigned the other player to the Video condition. I presented the Imagery condition participants with imagery designed to promote the key antecedent of flow, total concentration on the task at hand. I presented participants in the Video condition with a placebo consisting of videos of high-level male and female basketball competition (USA National Basketball Association), with general game play. All the procedures for Study 2 followed those employed in Study 1, aside from the change in imagery content to focus on concentration and video content to focus on game play without shooting. Thus, participants in both conditions undertook six 15-minute sessions over a 2-week period. I chose to use 15 minutes for the duration of the Imagery condition and the Video condition because this is an imagery duration that has previously been found to be effective for this kind of task (Hinshaw, 1991). For the Imagery condition, I provided a brief introduction on the benefits of imagery skills, which was the only difference from Study 1, aside from the focus on concentration in the imagery content. I added this introduction to minimise the chance of participants in the Imagery condition losing interest because they did not believe that imagery would have any effect, a problem that occurred in Study 1, where I did not provide this introduction. For the video group, I also delivered a different video to watch in each session. Participants in both conditions completed the intervention logbook after each session and the training diary for each training session that included shooting practice. Then participants completed the basketball shooting task and the FSS-2 at post-test. Finally, they participated in the short debriefing interview.

Measures

Measures included a Demographic Form to collect relevant demographic information, and I screened imagery ability to ensure that participants had moderate to high imagery ability on key dimensions and sense modalities. I measured intensity of flow experience and basketball shooting performance at pre-test and post-test. In addition, I asked participants to complete an intervention logbook each time they finished an intervention session and a training diary whenever they undertook basketball training that included shooting practice. Finally, I conducted a debriefing interview with each participant, at the end of their participation in the study.

Demographic Form. As described in Study 1. The Demographic Form is presented in Appendix D.

Sport Imagery Ability Measure (SIAM; Watt et al., 2004; Watt et al., 2018). As described in Study 1. The SIAM is presented in Appendix E.

Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002). As described in Study 1. The FSS-2 is presented in Appendix F.

Basketball Shooting Performance. As described in Study 1. The scoring sheet is presented in Appendix I.

Intervention Logbook. As in Study 1, I gave participants a logbook prior to the start of the Imagery and Video interventions in which to record the dates and times of their intervention sessions, as well as any comments on the sessions. The format of the logbook is presented in Appendix H.

Training Diary. As described in Study 1. The format of the training diary is presented in Appendix L.

Debriefing Interviews. As in Study 1, I conducted short debriefing interviews immediately after the post-test to check that participants understood what they were asked to do and felt they were able to follow the instructions they were given. The guide for the social validation interviews is described in Study 1. Debriefing interviews are presented in Appendix J.

Interventions

Imagery Condition. I produced the Imagery intervention to integrate best practice of imagery design to guide experience of imagery based on concentration principles. The key aspects of the script in this study include total focusing on the task at hand to achieve effective shooting performance. Having participants concentrate on their shooting skills was the major objective of Study 2. The intervention for enhancing total concentration describes imagery in which participants imagined they were totally focused on shooting basketballs. Because participants were competitive players with at least moderate skill levels, I instructed them to focus on their usual routine for shooting baskets. They were not directed to focus on skill production because, at their skill level, the shooting skill should be automatic. Thus, a focus on the skill creation would be likely to lead to a switch to controlled processing with an accompanying decrement in performance (e.g., Mesagno et al., 2009). Thus, in this study, I guided participants to focus on the feel of the ball, the location of the basket, and their readiness to shoot. Then they focused on construction of the shot, watching the ball travelling to the basket, and observing the successful outcome of the shot.

The following example of the material illustrates what the script was about. Study 2 focused on total concentration. This part of the script occurred late in the imagery session, when participants just had eight shots left to imagine from the final 3-point position,

> You have now performed 72 shots, eight each from the five 2-point shooting positions (blue crosses), then you adjusted your concentration to focus on the 3-point shooting task and shot eight shots from four of the five 3-point shooting positions. You have been keeping score, which is easy because you can always see clearly whether the ball goes through the basketball ring or not and you add one point to your score each time the shot is successful. You are focusing your attention on the 3-point shooting skill, not paying attention to anything else.

Participants completed six imagery-training sessions over a 2-week period, each session lasting 15 minutes. They were required to imagine shooting eight 2- and 3-point shots from each of the two distances (i.e., 4.5 metres, 6.75 metres) and five angles (i.e., 90 degree to end line, 60 degrees to end line on left and right, 30 degrees on left and right) used in the performance test. The imagery sessions were conducted on Monday, Wednesday, and Friday of each week, with the key aspect of the script in this study being imagining attaining sustained concentration on shooting performance. At the end of each session, participants completed a logbook to indicate the dates and times when they completed the imagery sessions and added any comments on their experiences during the sessions. The basketball coach of the team that the players came from and a PhD researcher who was also an international level basketball player and referee gave feedback that helped to finalise the scripts. The script for the Imagery intervention condition is presented in Appendix G.

Video Placebo Condition. The video sessions involved video of general male and female basketball game competition from the US National Basketball Association (NBA) league.
I chose games from the Finals Series of the USA NBA (2016) because they are especially exciting and interesting. Participants were given a different video to watch in each session to

minimise the risk of boredom. I presented participants in the Video condition with basketball videos of elite players performing in competition matches demonstrating all the skills of elite basketball, include shooting. Of course, it is helpful for developing players to watch highly-skilled performance of each basketball skill. Watching how players dribble, pass, find space, shoot and move around the court all provide valuable information. In training players could learn by watching any of these skills separately or in combination. The video sessions were conducted on Monday, Wednesday, and Friday of each week. The intention was that participants in this condition would perceive the task they were performing to be relevant to their performance in basketball. Based on the results of Study 1, where it appeared that participants in a basketball shooting video condition improved their shooting due to incidental observational learning, there was not only successful shot on shooting skill in the videos shown in the present study. I gave the participants in this condition no instructions about what to do during the 15-minute sessions. I presented an introduction to participants in the Video condition, lasting the same length of time as the Imagery condition introduction, about the importance for the research of carefully following all the instructions and at the same time enjoying watching the best basketball players in the world performing a range of skills in the videos. At the end of the video, participants completed a logbook to indicate the dates and times when they completed the sessions and added any comments on their experiences during the sessions.

Procedure

Prior to commencement, the research received approval from the Victoria University Human Research Ethics Committee. I recruited participants by sending information to local basketball clubs in Melbourne, Australia. Players read an Information Statement describing the purpose of the study and all the procedures (Appendix B). Players who wished to participate in the study as volunteers signed and returned the provided consent form (Appendix C). I administered the Demographic Form and the SIAM (Watt et al., 2004) to select 30 basketball players who reported moderate- to high-level imagery ability. Then they completed the basketball-shooting task, shooting 40 2-point shots and 40 3-point shots from five angles around the ring. After that, I assigned one member of each pair at random to the Imagery condition and I assigned the other player to the Video condition until there were 15 participants in each condition. Once they had completed the basketball-shooting task, I gave participants 30 minutes to fill out the FSS-2 to complete the pre-test. Participants then completed six imagery or video placebo sessions over two weeks. I instructed participants in the Imagery condition to use imagery for 15 minutes in each of the six sessions. Participants did imagery rehearsal or watched basketball matches three times a week on Mondays, Wednesdays, and Fridays. I asked participants in the Imagery condition to comment on their experiences of imagery at the end of each session, as a manipulation check. During the two weeks of their involvement in the interventions, participants also completed a practice log, recording the extent of their basketball practice during the period of the study. Following the six sessions of imagery or video, I conducted the post-test on basketball shooting performance. Then after 5 to 10 minutes rest I asked participants to complete the FSS-2 and allowed them up to 30 minutes to complete the scale. At the end of the study, I gave all the participants the short debriefing interview on their flow and imagery experiences as well as information on their performance during the study. Finally, I thanked the players for participating in the study.

Analysis

I first conducted manipulation checks to determine whether all participants in the Imagery and Video conditions completed the six intervention sessions as instructed. There were two sources of information for the manipulation checks. First, I examined participants' intervention logbooks to determine whether participants reported completing all six sessions and whether their reports at the end of each session indicating that they followed the instructions for their condition. Then, I examined the debriefing interviews in which participants summarised the extent to which they had understood and followed the instructions for their condition across the whole six intervention sessions. I conducted the data analysis using the independent-samples T-tests and 2-Way, Mixed-design ANOVAs. Firstly, I applied T-tests on the SIAM imagery ability screening data at pre-test in both the Imagery and Video conditions to test whether there was any difference in imagery ability between participants in the two conditions. Secondly, I conducted T-tests on participants' experience of competitive basketball and their training diary data to determine whether there was any significant difference in competition experiences or the amount of shooting practice conducted by participants in the Imagery and Video conditions. Then, subject to there being no difference between the conditions on these variables, I applied Two-Way Mixed-Design ANOVA to examine the independent groups factor of condition (Imagery, Placebo), the repeated measures factor of occasion (pre-test, post-test), and the interaction effect of conditions x occasions for the dependent variables of global flow, the nine flow dimensions, and 2- and 3-point shooting, as well as total shooting.

Results

Manipulation Check

Participants completed a logbook at the end of each imagery or video session in which they provided information about the session. Participants' responses indicated that all 30 basketball players in both the Imagery intervention and the Video placebo condition completed the six intervention sessions. I examined the logbooks to gain insight into the experiences of

Imagery and Video condition participants of their basketball shooting performance and flow state. The experience was based on the extent to which they enjoyed the imagery session and consequently experienced the session to be shorter than its actual duration. Participants also commented on their experience of the act of basketball shooting. Participants were encouraged to undertake the session on a weekday during the afternoon or night-time. They did not provide many comments about their experience of the basketball shooting task, including notes on what worked well for them and anything that was not so good. However, participants commented on each imagery session during the intervention. Participants in the Imagery condition recounted aspects of the imagery experience, such as the fact that they were able to image the picture of their shooting training very clearly. Participants in the Video condition reported that they experienced really enjoyed when watching the content from the basketball games in the Video intervention. All the information in the logbooks indicated that participants undertook all the sessions and followed the instructions for the research condition in which they participated. This information was repeated in the final debriefing interviews in which participants reported on their experience across the whole of the study. Again, they indicated that they understood what they were asked to do as participants in the study and that they were able to carry out the instructions as intended. These manipulation checks provided confirmation that the interventions had worked as planned, so I conducted further analyses with all participants included.

Imagery Ability Screening

The SIAM was used to screen participants' imagery ability prior to pre-test to check that potential participants had sufficient imagery ability to undertake the Imagery intervention and that imagery ability was equivalent between participants in the Imagery condition and the Video intervention. As shown in Table 4.1, means on the four key factors of imagery ability, namely the visual and kinaesthetic sense subscales, and the vividness and control dimension subscales of the SIAM were all moderate to high. This indicates that participants overall had acceptable levels of imagery ability. In addition to the group means, all potential participants demonstrated at least moderate levels of imagery ability on these four key subscales. The results of the independent-samples T-tests showed no significant differences between the means for the Imagery intervention and the Video intervention on any of the four key imagery ability subscales or on the means for the total SIAM scores across the 12 SIAM subscales, so I concluded that all the potential participants were suitable for the study and that there were no systematic differences between the two intervention conditions in terms of imagery ability.

Table 4.1.

Means and Standard Deviations, T-test, F-Values and p-Values of SIAM Scores for the Imagery Intervention and the Video Placebo Intervention

SIAM SUBSCALES	CONDITION	*M*	*SD*	*F*	*p*
VISUAL	Imagery	306.40	54.16	.50	.48
	Video	293.20	46.82		
KINAESTHETIC	Imagery	302.40	68.41	.57	.45
	Video	271.87	53.52		
VIVIDNESS	Imagery	290.20	56.10	.76	.39
	Video	266.00	64.55		
CONTROL	Imagery	292.87	69.50	1.19	.28
	Video	253.67	52.93		

Basketball Competition Experience and Training During the Study

I conducted T-test to compare competitive basketball experience prior to involvement in this study and the self-reported basketball training during the study of participants in th Imagery intervention condition and the Video placebo condition. There was no significant difference between mean basketball experience of participants in the Imagery condition (*M* = 9.46, *SD* = 6.01) and the Video condition (*M* = 6.26, *SD* = 4.39), with $F(1, 28) = .86$, $p = .36$, $\eta^2 = .08$. However, there was a significant difference between mean basketball training during the study of participants in the Imagery condition (*M* = 7.66, *SD* = 5.61) and the Video condition (*M* = 3.66, *SD* = 2.43), with $F(1, 28) = 5.92$, $p = .02$, $\eta^2 = .02$, which is a very large effect size. Specifically, participants in the Imagery condition undertook significantly more basketball training during the study than participants in the Video condition. To address this significant difference, I employed Two-Way Analysis of Covariance (ANCOVA) in all the flow and performance analyses that follow. In all cases, participants' basketball training time during the study was the covariate, and the ANCOVAs examined the main effect of conditions (Imagery, Video), the main effect of occasions (pre-test, post-test), and the conditions x occasions interaction effect.

Global Flow State and Flow State Dimensions

The results for the global flow state and nine flow dimensions are presented graphically in this section and the results of the ANCOVAs for global flow state are presented in Table 4.2.

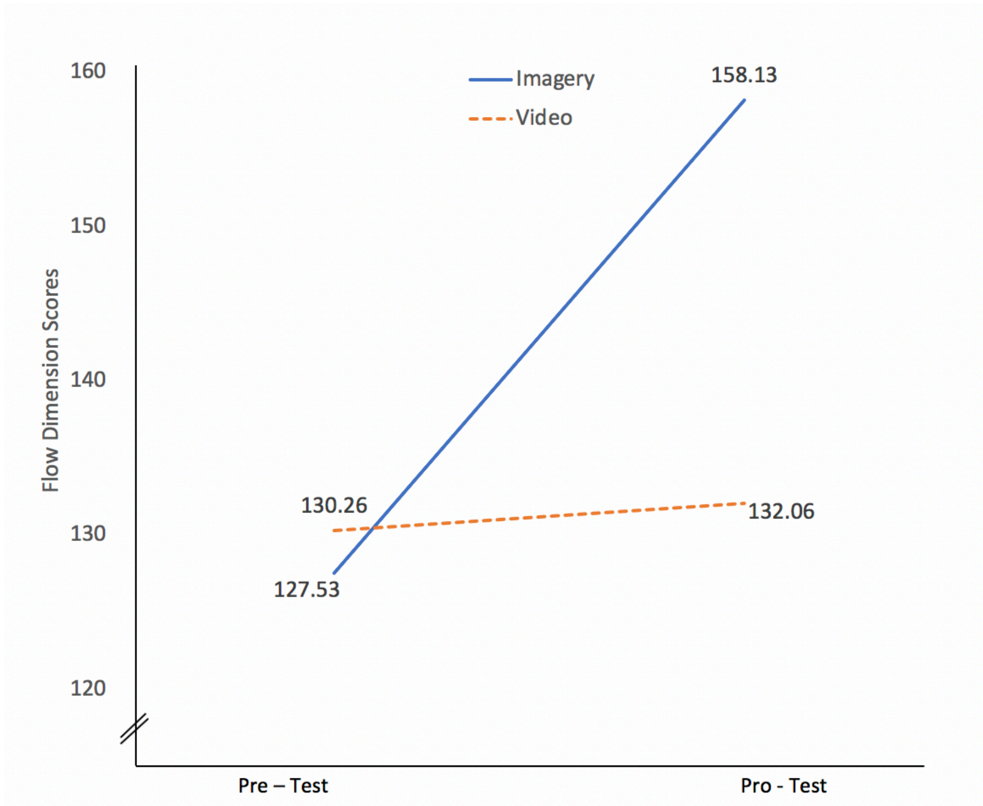

Figure 4.1 Mean global flow state for the Imagery and Video conditions at pre-test and post-test.

Figure 4.1 shows the means for the global flow dimension for the Imagery and Video intervention conditions at pre-test and post-test. The Imagery condition showed an increase in global flow state from pre-test to post-test with a greater increase than the Video condition. Global flow state was slightly lower at pre-test and considerably higher at post-test for the Imagery condition than for the Video condition, displaying a disordinal interaction. Two-Way Mixed-design ANCOVA, with an independent groups' factor, conditions, with two levels (Imagery, Video) and one repeated measures factor, occasions, with two levels (pre-test, post-test) revealed no significant main effect of condition, and significant interaction effect ($p < .001$), with a very large effect size, and there was a significant main effect of occasions ($p < .001$), with a very large effect size. The results indicate that significant interaction effect in which the Imagery condition showed a greater increase in global flow state than the Video condition suggests that the post-test increase for the sample might be largely attributable to the increase in the Imagery condition from pre-test to post-test.

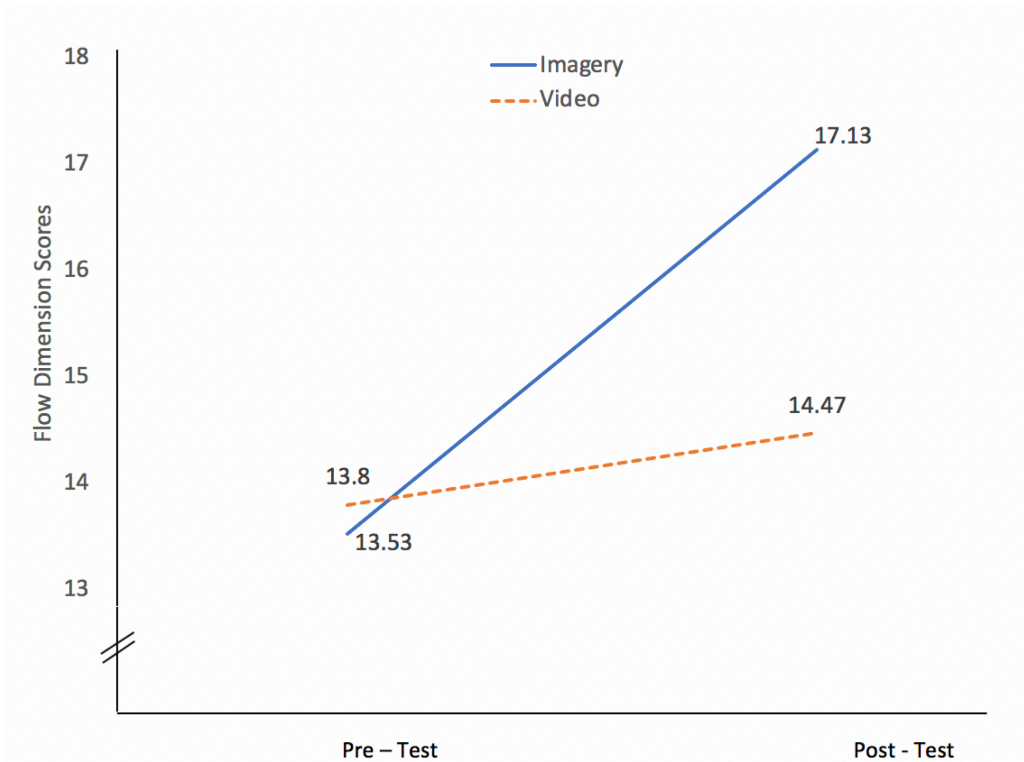

Figure 4.2. Mean C-S Balance for the Imagery and Video conditions at pre-test and post-test

Figure 4.2 shows the means for the C-S balance dimension for the Imagery and Video intervention conditions at pre-test and post-test. Both conditions showed an increase in C-S balance from pre-test to post-test with a greater increase for the Imagery condition, which was slightly lower at pre-test and considerably higher at post-test than the Video condition, depicting a disordinal interaction. Two-Way, Mixed-design ANCOVA, with an independent groups' factor, conditions, with two levels (Imagery, Video) and one repeated measures factor, occasions, with two levels (pre-test, post-test), revealed no significant main effect of condition, a significant main effect of occasion ($p < .001$), with a very large effect size, and a significant interaction effect ($p < .001$), with a very large effect size (see Table 4.2). Participants in the Imagery condition showed a significantly greater increase in C-S balance between pre-test and post-test than participants in the Video condition.

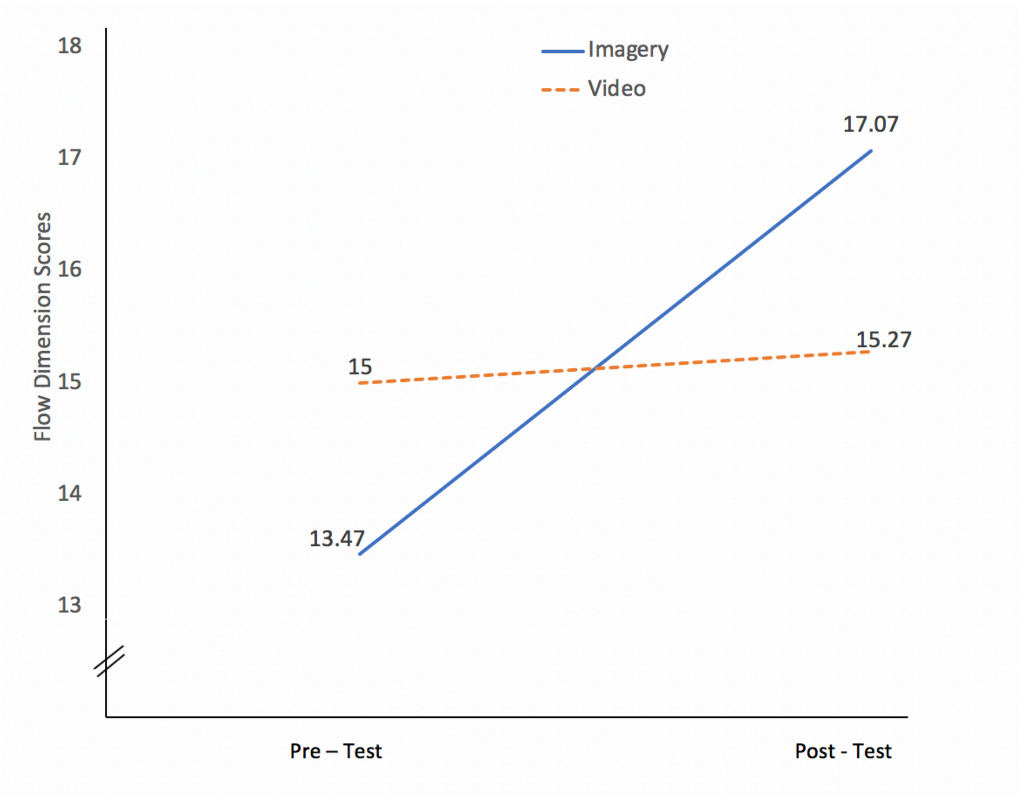

Figure 4.3. Mean Merging of Action Awareness for the Imagery and Video conditions at pre-test and post-test

Figure 4.3 shows the means for the merging of the action and awareness dimension of flow state. The Imagery condition showed a substantial increase from pre-test to post-test, whereas the Video condition showed little difference in the slope from pre-test to post-test. The Video condition mean was much higher than the Imagery condition mean at pre-test, but the Imagery condition mean was substantially higher than the Video condition mean at post-test. The crossover of the Imagery condition mean and the Video condition mean on this graph depicts a disordinal interaction. Two-Way, Mixed-design ANCOVA revealed no significant main effect of conditions, but a significant main effect of occasions ($p < .001$), with a very large effect size, and a significant interaction effect ($p < .001$), with a very large effect size. The main effect of occasion appears to be due almost entirely to the substantial increase in the Imagery condition, which reflects the significant interaction effect.

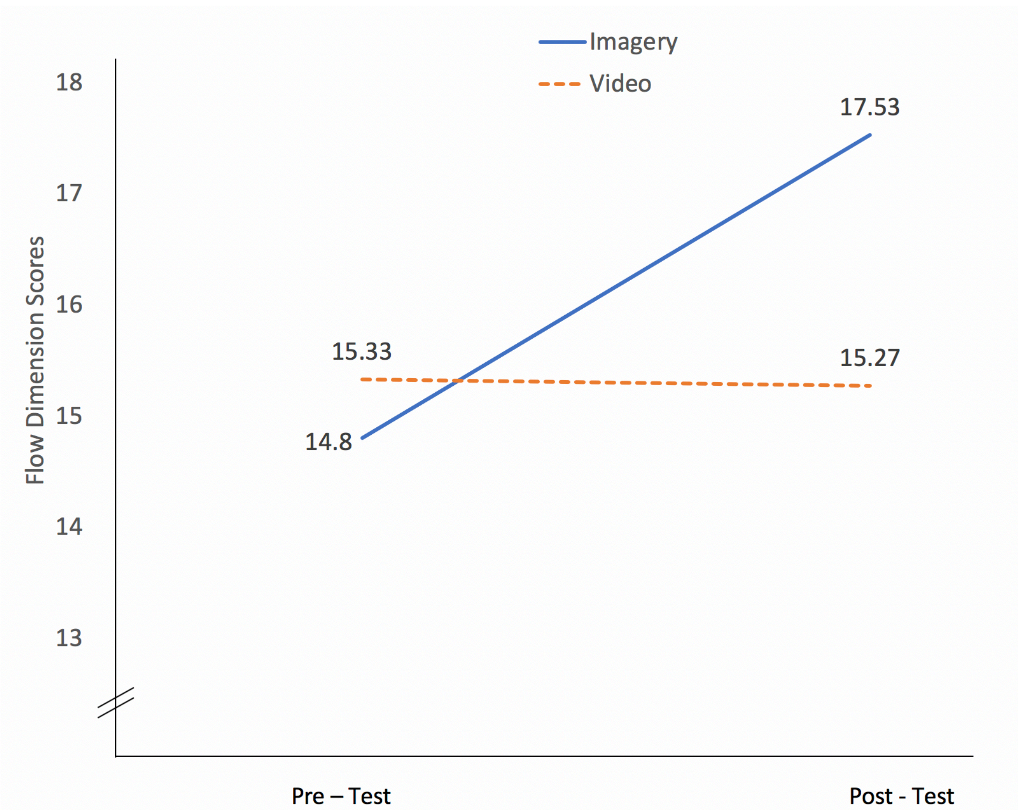

Figure 4.4. Mean Clear Goals for the Imagery and Video conditions at pre-test and post-test

Figure 4.4 shows the means for the clear goals flow state dimension for the intervention conditions and occasions. The Imagery condition showed a substantial increase from pre-test to post-test, whereas the Video condition showed a slight drop. The crossover of the Imagery condition mean and the Video condition mean depicts a disordinal interaction. Two-Way Mixed-design ANCOVA revealed no significant conditions main effect, but a significant occasions main effect ($p < .001$), with a very large effect size, and a significant interaction effect ($p < .001$), with a large effect size. The main effect of occasions seems to be due to the large increase in the Imagery condition from pre-test to post-test because the mean for the Video condition declined from pre-test to post-test.

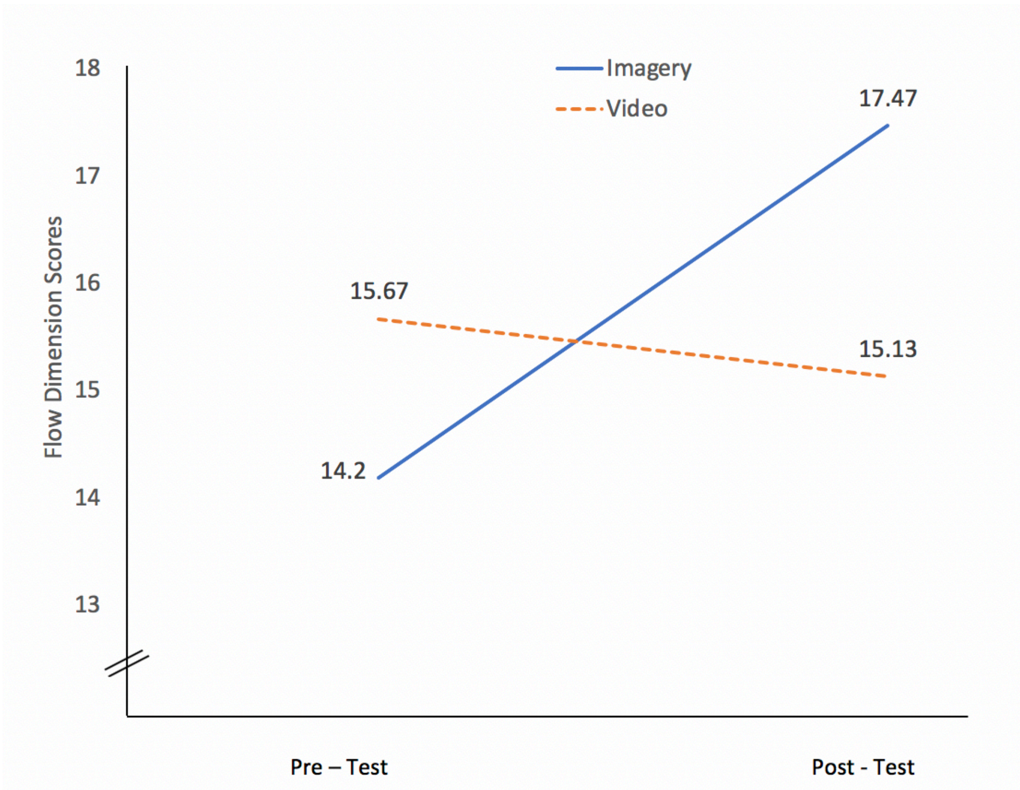

Figure 4.5. Mean Unambiguous Feedback for the Imagery and Video conditions at pre-test and post-test

Figure 4.5 shows the means for the unambiguous feedback flow dimension for the Imagery and Video intervention conditions at pre-test and post-test. The Imagery condition shows a relatively steep increase from pre-test to post-test, whereas the Video condition shows a reduction from pre-test to post-test. The crossover of the Imagery and Video conditions in this graph depicts a disordinal interaction. Two-Way, Mixed-design ANCOVA for unambiguous feedback revealed no significant main effect of conditions, a significant main effect of occasions (p = .001), with a very large effect size, and a significant interaction effect (p < .001), with a large effect size. The main effect of occasion, again, appears to result from the substantial increase in the Imagery condition from pre-test to post-test.

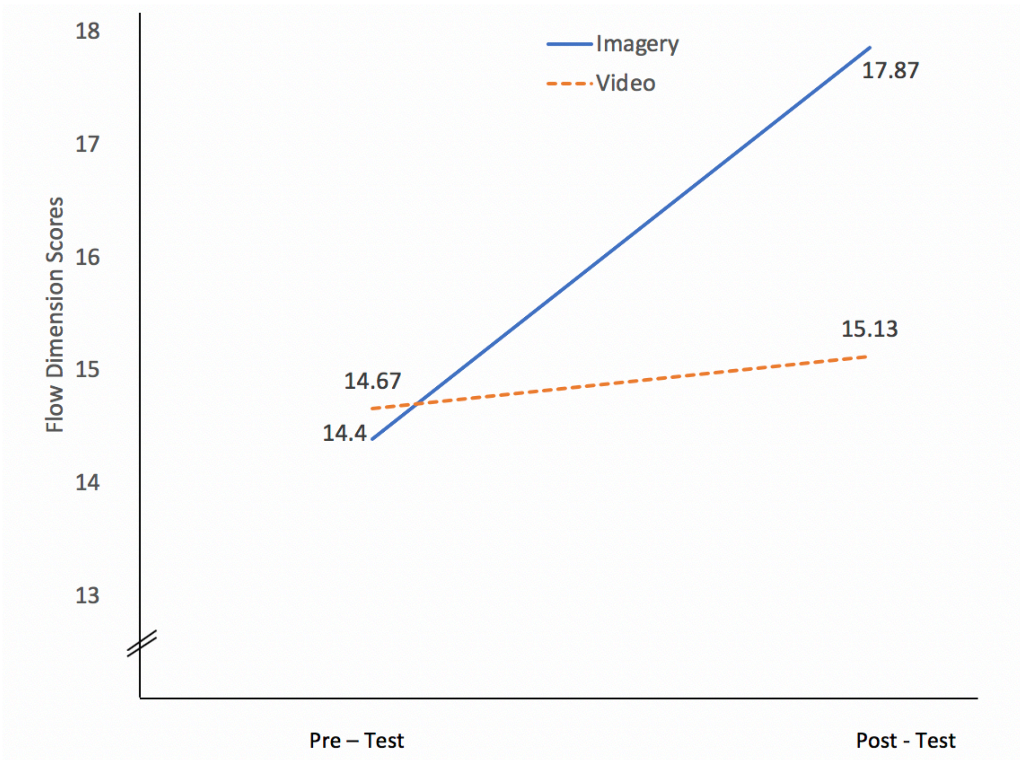

Figure 4.6. Mean Concentration on the Task at Hand for the Imagery and Video conditions at pre-test and post-test

Figure 4.6 shows the means for the concentration on the task at hand flow dimension for the Imagery and Video intervention conditions and occasions. Both conditions showed increases in the concentration dimension from pre-test to post-test, however, the Imagery condition showed a substantially larger increase from pre-test to post-test than the Video condition. The crossover of the Imagery and Video conditions in this graph depicts a disordinal interaction. Two-Way, Mixed-design ANCOVA for concentration on the task at hand revealed no significant condition main effect, a significant main effect of occasion ($p < .001$), with a very large effect size, and a significant interaction effect ($p < .001$), with a very large effect size. In this case, the main effect of occasions does appear to result from both conditions increasing from pre-test to post-test. At the same time, the significant interaction effect indicates that the Imagery condition increased significantly more than the Video condition from pre-test to post-test.

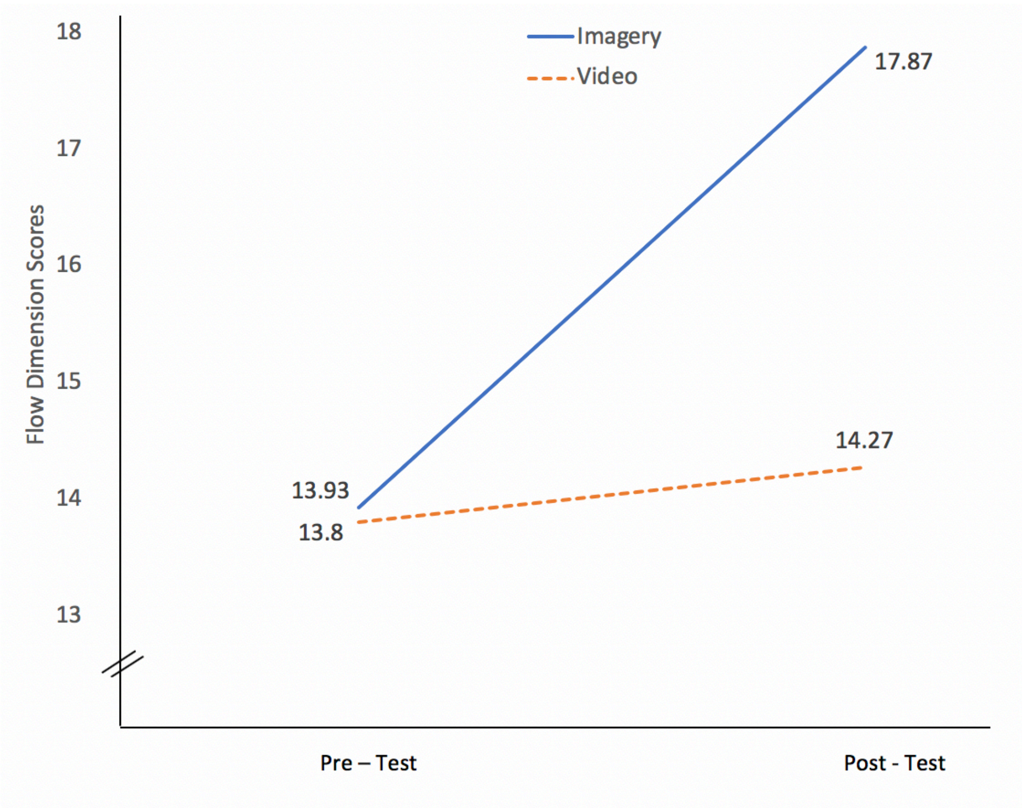

Figure 4.7. Mean Sense of Control for the Imagery and Video conditions at pre-test and post-test

Figure 4.7 shows the means for the sense of control flow state dimension for the Imagery and Video interventions at pre-test and post-test. The pre-test mean for the Imagery condition was similar to the Video condition, but the graph of the Imagery intervention condition showed a much larger increase in flow state than the Video condition. This reflects an ordinal interaction. Two-Way, Mixed-design ANCOVA for sense of control revealed a significant conditions main effect (p = .05), with a large effect size, a significant main effect of occasions (p < .001), with a very large effect size, and a significant interaction effect (p < .001), with a very large effect size. The conditions main effect appears to be largely attributable to the much larger increase in sense of control for the Imagery condition than for the Video condition from pre-test to post-test, which might also account of the main effect of occasions. The significant interaction effect indicates that the Imagery condition showed a significantly larger increase from pre-test to post-test than the Video condition.

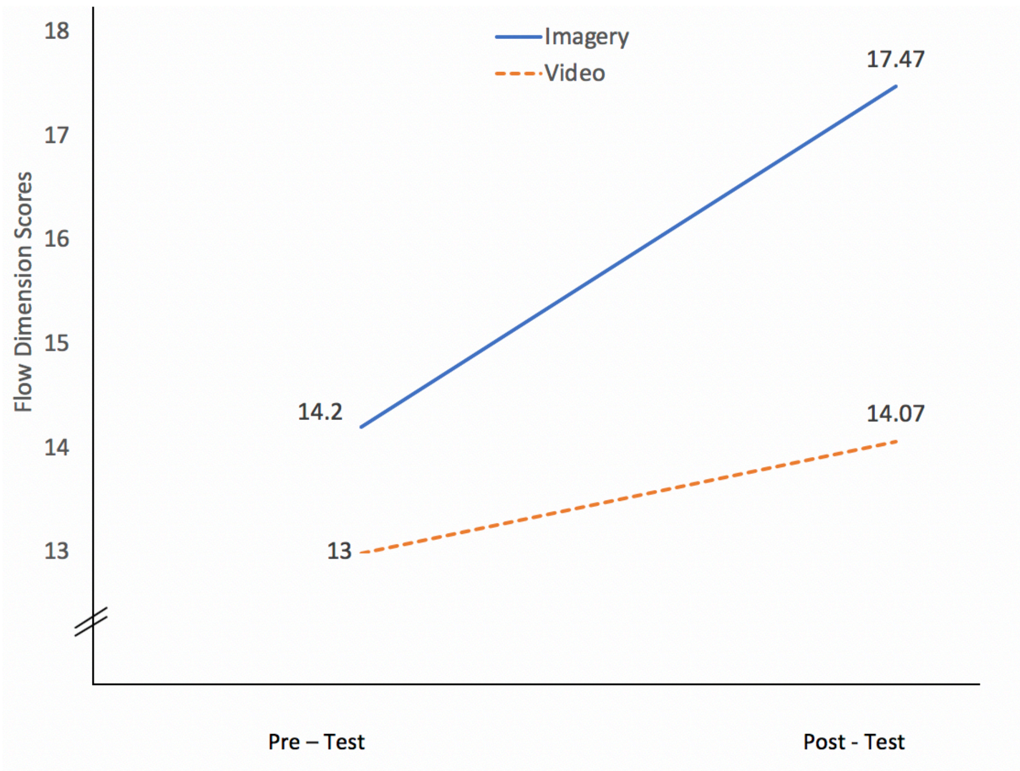

Figure 4.8. Mean Loss of Self-Consciousness for the Imagery and Video conditions at pre-test and post-test

Figure 4.8 shows the means for the loss of self-consciousness flow state dimension for the Imagery and Video intervention conditions at pre-test and post-test. Both the Imagery and Video conditions showed increases from pre-test to post-test. The increase for the Imagery intervention was relatively steep, whereas the increase for the Video condition was moderate in terms of slope. In addition, participants in the Imagery condition reported considerably higher loss of self-consciousness at pre-test. Two-Way, Mixed-design ANCOVA for loss of self-consciousness revealed a significant conditions main effect ($p = .007$), with a large effect size, a significant main effect of occasions ($p < .001$), with a very large effect size, and a significant interaction effect ($p < .001$), with a very large effect size. These statistics indicate that the Imagery condition was significantly higher than the Video condition on loss of self-consciousness at pre-test and post-test. The main effect of occasions seems to be largely due to the strong increase observed for the Imagery condition from pre-test to post-test, which is also reflected in the significant interaction effect.

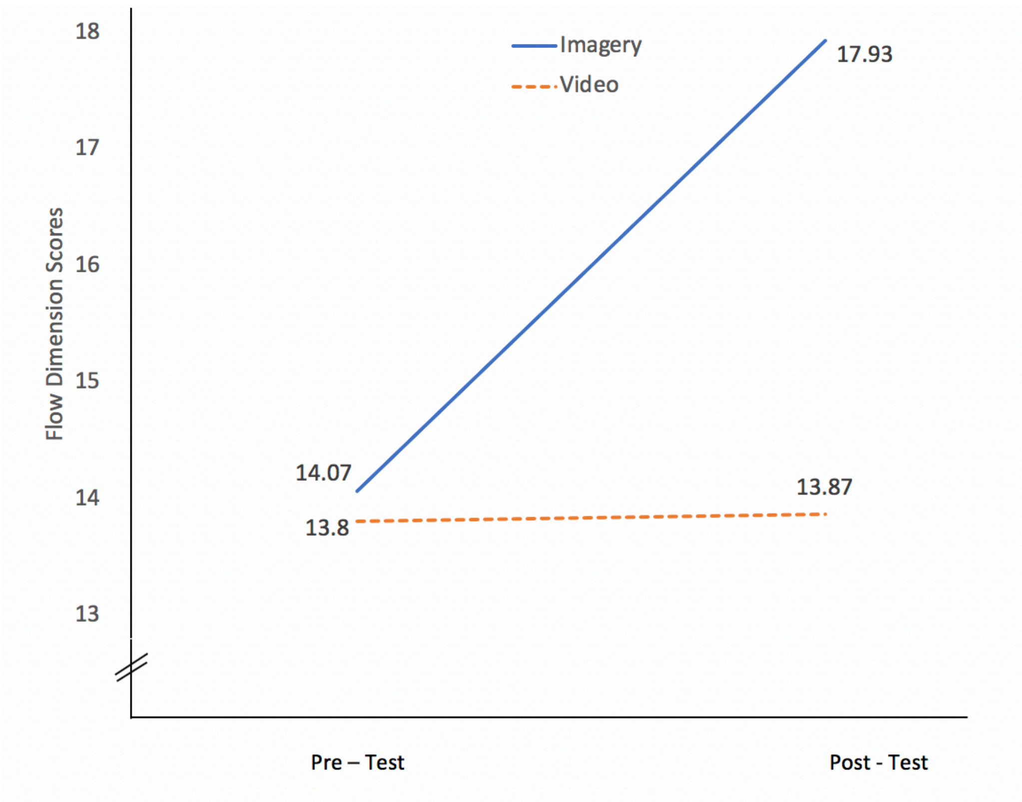

Figure 4.9. Mean Transformation of Time for the Imagery and Video conditions at pre-test and post-test

Figure 4.9 shows the means for the transformation of time flow state dimension for the Imagery and Video intervention conditions at pre-test and post-test. The Imagery condition showed a substantial increase in transformation of time from pre-test to post-test. The Video condition showed virtually no change from pre-test to post-test. This figure showed an ordinal interaction. Two-Way, Mixed-design ANCOVA for transformation of time revealed a significant main effect of conditions ($p < .001$), with a large effect size, a significant main effect of occasions ($p < .001$), with a large effect size, and a significant interaction effect ($p < .001$), with a large effect size. The main effect for conditions appears to be the result of the very large difference between the Imagery and Video conditions at post-test. Similarly, the main effect of occasions appears to be due to the substantial increase in the Imagery condition at post-test, which indicates that the Imagery condition increased significantly more than the Video condition from pre-test to post-test, that is, there was also a significant interaction effect.

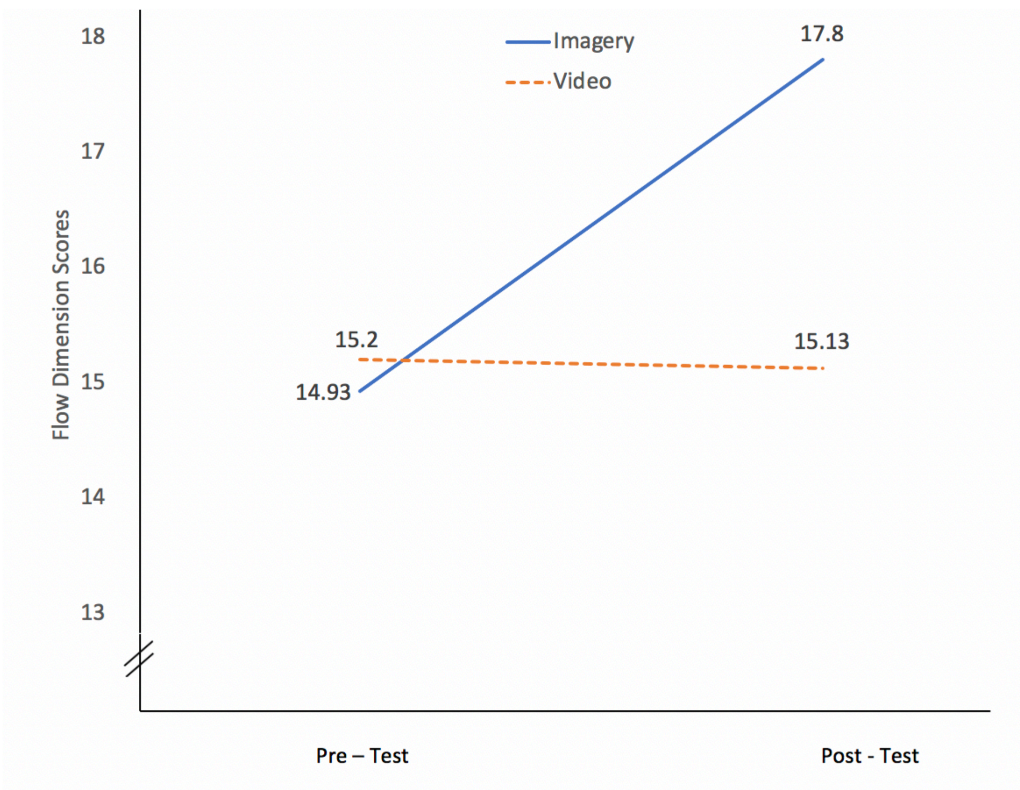

Figure 4.10. Mean Autotelic Experience for the Imagery and Video conditions at pre-test and post-test

Figure 4.10 shows the means for the autotelic experience flow state dimension for the

Imagery and Video intervention conditions at pre-test and post-test. The Imagery intervention condition showed a moderate to steep increase from pre-test to post-test. The Video condition showed a slight reduction from pre-test to post-test. The crossover of the Imagery condition mean and the Video condition mean depicts a disordinal interaction. Two-Way, Mixed-design ANCOVA for Autotelic Experience revealed no significant conditions main effect, but it did reveal a significant main effect of occasions ($p < .001$), with a large effect size, and a significant interaction effect ($p < .001$), with a large effect size. The main effect of occasions seems to be due to the large increase in the Imagery condition at post-test, which is a result of the significantly larger increase in the Imagery condition from pre-test to post-test.

The means and SDs for the Imagery and Video intervention conditions for all nine flow state dimensions are presented in Table 4.2. This table also includes the ANCOVA *F*, *p*, and η^2 values for the conditions main effect, the occasions main effect, and the interaction effect for global flow state and each flow dimension.

Table 4.2.

Means and Standard Deviations, and ANCOVA, F, p, and η^2 Values for the Nine Flow Dimensions for the Imagery and Video Intervention Conditions at Pre-test and Post-test

Flow Subscales	Condition	Pre - Test		Post -Test		Condition			Occasion			Interaction		
		M	SD	M	SD	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
Global Flow State	Imagery	127.53	18.68	158.13	14.55	3.22	.08	.10	78.95	<.001*	.73	62.38	<.001*	.69
	Video	130.27	22.84	132.07	16.85									
Challenge Skill-Balance	Imagery	13.53	3.18	17.13	2.06	1.28	.27	.04	43.97	<.001*	.61	20.78	<.001*	.42
	Video	13.80	3.62	14.47	3.04									
Merging of Action Awareness	Imagery	13.47	2.94	17.07	2.31	.02	.88	.001	31.23	<.001*	.52	23.21	<.001*	.45
	Video	15.00	2.75	15.27	2.34									
Clear Goals	Imagery	14.80	2.83	17.53	1.92	.75	.39	.02	16.99	<.001*	.38	18.73	<.001*	.40
	Video	15.33	3.75	15.27	2.68									
Unambiguous Feedback	Imagery	14.20	2.48	17.47	1.30	32.03	.66	.53	16.57	<.001*	.37	32.03	<.001*	.53
	Video	15.67	3.41	15.13	3.68									
Concentration on the Task at Hand	Imagery	14.40	2.06	17.87	1.30	3.20	.08	.10	18.58	<.001*	.40	20.06	<.001*	.42
	Video	14.67	3.86	14.60	2.19									
Sense of Control	Imagery	13.93	2.18	17.87	2.97	4.12	.05*	.13	57.53	<.001*	.67	35.71	<.001*	.56
	Video	13.80	3.14	14.27	2.08									
Loss of Self Consciousness	Imagery	14.20	2.75	17.47	1.35	8.61	.007*	.23	25.63	<.001*	.48	6.60	<.001*	.19
	Video	13.00	3.46	14.07	1.58									
Transformation of Time	Imagery	14.07	2.15	17.93	1.71	14.22	<.001*	.34	31.64	<.001*	.53	29.53	<.001*	.51
	Video	13.80	1.85	13.87	1.59									
Autotelic Experience	Imagery	14.93	1.98	17.80	1.56	2.65	.11	.08	32.49	<.001*	.54	35.66	<.001*	.56
	Video	15.20	2.68	15.13	2.13									

Basketball Shooting Performance

The results for 2- and 3-point basketball shooting performance, and total shooting performance are presented graphically in this section. Then the results of Two-Way, Mixed-design ANCOVAs are presented in Table 4.3.

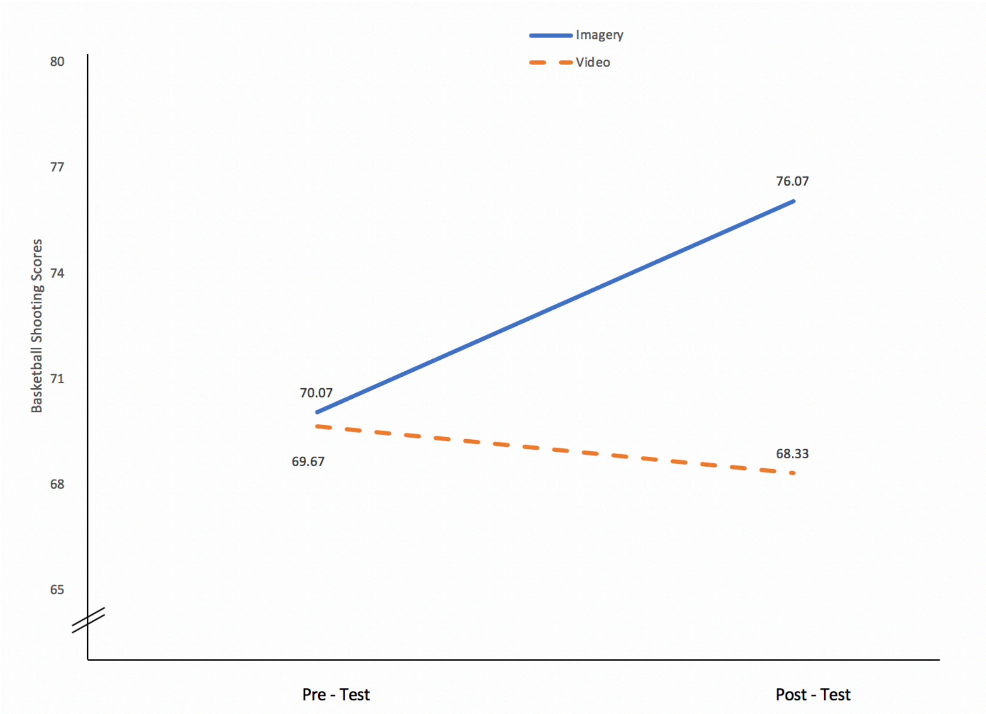

Figure 4.11. Mean 2-point shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 4.11 shows the means for the 2-point shooting performance for the Imagery and Video intervention conditions at pre-test and post-test. The graphs indicate that both conditions had similar pre-test means, but participants in the Imagery condition improved their performance substantially from pre-test to post-test, whereas the Video condition showed a reduction in performance from pre-test to post-test. I conducted a Two-Way, Mixed-design ANCOVA to compare the 2-point shooting score differences between conditions on different occasions. Analysis revealed no significant conditions main effect, a significant main effect of occasions

(p = .01), with a large effect size, and a significant interaction effect (p < .001), with a large effect size. Given that the mean for the Video condition dropped from pre-test to post-test, the main effect of occasion appears to be due entirely to the large increase in 2-point shooting performance in the Imagery condition at post-test. Most notable is the interaction effect, which indicates that 2-point shooting in the Imagery condition increased from pre-test to post-test significantly more than the Video condition.

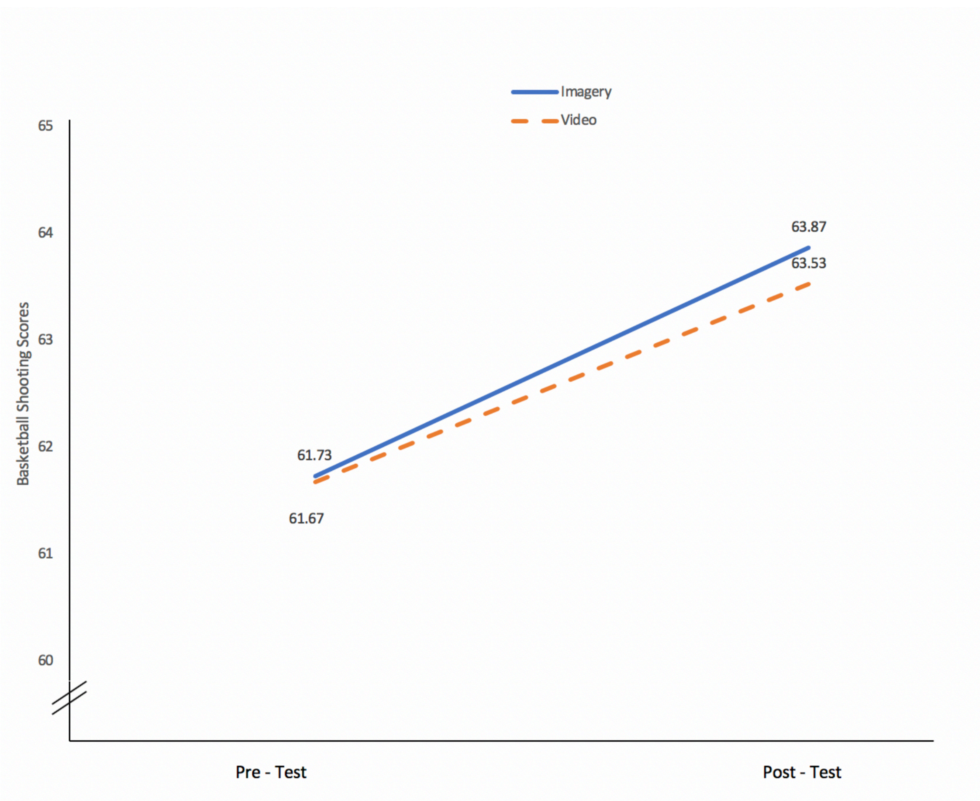

Figure 4.12. Mean 3-point shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 4.12 shows the means for 3-point shooting performance for the Imagery and Video intervention conditions at pre-test and post-test. Both conditions depicted moderate increases from pre-test to post-test, which had similar slopes. I conducted a Two-Way, Mixed-design ANCOVA to compare the 3-point shooting score differences between the conditions on different occasions. Analysis revealed no significant conditions main effect, no significant main effect of occasions, and no significant interaction effect. Although the increases from pre-test to post-test appear visually impressive, the scale on the ordinate (vertical) axis is large, so the differences from pre-test to post-test are only around two points, representing a 3.5% increase for the imagery condition and a 3.0% increase for the Video condition from pre-test to post-test, which are not meaningful increases in shooting performance.

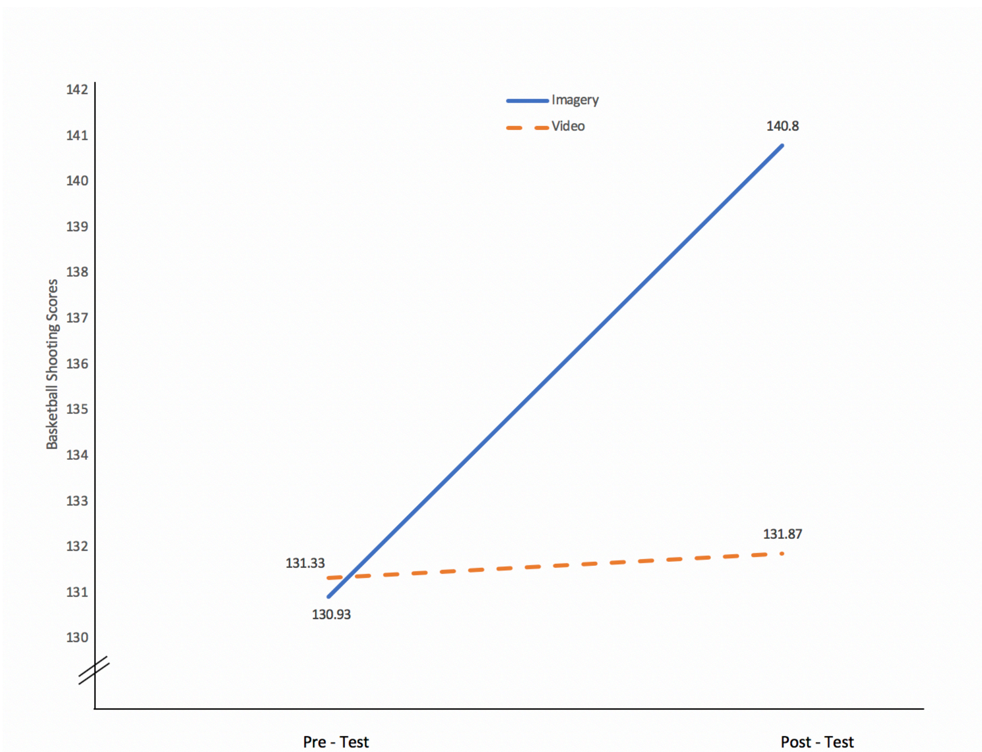

Figure 4.13. Mean total shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 4.13 shows the means for total shooting performance for the Imagery and Video intervention conditions at pre-test and post-test. The Imagery condition showed a substantial increase in performance from pre-test to post-test, whereas the increase for the Video condition was minimal. There was a crossover between the Imagery and Video conditions between pre-test and post-test suggestive of a disordinal interaction. I compared the means of the total shooting scores, that is, the 2-point scores plus the 3-point scores, for conditions and occasions, using a Two-Way, Mixed-design ANCOVA. Analysis showed no significant conditions main effect, a significant main effect of occasions ($p < .001$), with a large effect size, and a significant interaction effect ($p < .001$), with a large effect size. Again, the occasions main effect appears to be primarily due to the large increase in total shooting in the Imagery condition. However, the most notable effect is for the interaction between conditions and occasions, which shows that the imagery condition increased significantly more than the Video condition from pre-test to post-test.

The means and SDs for 2- and 3-point shooting performance, and total shooting performance for the Imagery intervention condition and the Video condition are presented in Table 4.3, along with the ANCOVA *F, p, and* η^2 values for the condition main effect, the main effect of occasion, and the interaction effect for each shooting performance comparison.

Table 4.3.

Means, and Standard Deviations, and ANCOVA F, p, and η^2 *Values for Shooting Performance for Each Intervention Condition and Occasion (Pre-test and Post-test)*

Flow Subscales	Condition	Pre - Test		Post -Test		Condition			Occasion			Interaction		
		M	SD	M	SD	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
2- Point	Imagery	70.07	6.20	76.07	5.06	3.17	.08	.10	7.53	.01	.21	18.59	<.001	.40
	Video	69.67	7.83	68.33	7.23									
3- Point	Imagery	61.73	7.26	63.87	7.98	.005	.94	.001	2.78	.10	.66	.01	.91	.001
	Video	61.67	9.90	63.53	8.89									
Total	Imagery	130.93	12.36	140.80	9.46	.86	.36	.03	25.19	<.001	.47	20.29	<.001	.42
	Video	131.33	14.78	131.87	14.34									

Debriefing Interviews

The 15 athletes who participated in the Imagery intervention reported on their imagery experiences during the imagery sessions. Participants attended six sessions over two weeks, then explained their experiences during the imagery sessions, including imagery of flow experience and imagery experience of performance. I did not conduct in-depth interviews to explore all participants' experiences during the study. I conducted brief post-study interviews designed as a manipulation check and brief exploration of the participants experiences of following instructions for the study. Thus, I do not think it is appropriate to expand this material too much. Most players imagined their performance under realistic conditions. In other words, they always engaged in imagery under those conditions in which they normally completed their basketball shooting and used the imagery perspective, internal or external, with which they were most comfortable.

Participants reported that they used specific intervention for their shooting performance in the imagery training program. They observed that they felt that concentration supported their technical, tactical, mental, and overall performance, for example, by focusing on a technical change, being more relaxed and focused, or just "going for it" in their shooting. Some of the basketball players in the Imagery condition felt able to replicate the sights, sounds, physical sensations, thoughts, and emotions that they would experience in an actual game, such as making visual imagery particularly clear. A number of participants in the Imagery condition also enjoyed and found useful the fact that they were able to increase the kinaesthetic sensations in their mental imagery to combine imagined and real sensations. They could imagine themselves making appropriate body movements and improving their shooting performance. The basketball players in the Imagery condition also reported that they imagined that time passed really quickly when then were imagining shooting baskets. They said that always happened when they imagined their shooting in matches. As one participant put it,

> I would imagine the game. I would try to use imagery to visualise what the ball looked like and I thought about how it feels and how it's going through the ring and how I would try to get to the hoop or get the goal.

In addition, the comments made by players showed that participants in the Imagery intervention used this technique to enhance their enjoyment of learning and to practice skills to increase performance, as well as to help them increase their concentration, so they were able to improve their shooting performance and flow experience.

The 15 basketball players in the Video condition also provided their experiences on flow and performance during the study. Participants attended six sessions over two weeks, then explained their experiences during the sessions, including flow experience and experience of performance. One of the athletes expressed their experience of the Video intervention, "I think it is about imagery and confidence... If I look at the video as well, it's helped me to see my strongest point and how to make me a lot better." When they trained, some basketball players reported that they found that one of the aspects of the task that they concentrated on was creating a mental picture of how best to deliver the ball to a team-mate and shoot in the desired way. When they imagined the basketball game in their mind, they thought about making shots in the same way as they had seen NBA players do it in the videos. They were watching where team-mates were moving and where opponents were moving, so, like the players in the Videos, participants in this condition reported that they felt they made the best decisions about whether to run with the ball or to pass it, and who to pass it to. They also had reflections after they watched Video condition sessions, such as regarding their attempts to reproduce training skills in matches, in the same way as the NBA players did in the videos. However, some athletes did not really enjoy the video because it was perceived as being boring and too long for them. They just wanted to play and practice their shooting skills, and they felt that there are times when they do not need to be coached or receive any comments from anyone. Thus, insights from the interviews helped to explain how participants in the Video condition perceived the placebo intervention.

Discussion

The purpose of current study was to examine the effect of an imagery intervention designed to target concentration on the task at hand on global flow state, flow state dimensions, and basketball shooting performance. In the first Study, I tested the effect of an imagery intervention that focused on goal setting and feedback related to a sports task to promote clear goals and unambiguous feedback, enhance flow state, and facilitate sports performance in a context where the challenge matched participants' skills for the task (Chapter 3). Thus, that study focused on using imagery to enhance three flow dimensions. In the present study, total concentration on the task was the single flow dimension on which I focused the imagery intervention. I used the same measures as in Study 1, namely the Flow State Scale-2 (FSS-2) and basketball shooting performance. Because self-reported basketball training time during the study was significantly greater for the Imagery condition than the Video condition, I employed Two-Way, Mixed-design ANCOVA to compare the independent groups factor of conditions (Imagery, Video) and the repeated measure factor of occasions (Pre-test, Post-test) on all nine flow dimensions and global flow state, with basketball-shooting training time as the covariate. I also used Two-Way, Mixed-design ANCOVA to examine 2-point, 3-point, and total basketball shooting performance, with basketball-shooting training time as the covariate. The predictions of this study were that the targeted flow dimension, total concentration on the task, and shooting performance would increase significantly more from pre- to post-test in the Imagery intervention condition than in the Video placebo intervention condition. Total concentration on the task did increase significantly more from pre-test to post-test in the Imagery condition than the Video condition. However, the Imagery condition also produced a significantly greater increase than the Video condition in all the other eight flow dimensions, which was not predicted. In addition, the Imagery intervention produced a significantly greater increase than the Video condition in 2-point and total basketball shooting, but there was only a moderate increase in 3-point shooting, which was equivalent for both the Imagery and the Video conditions.

Jackson and Csikszentmihalyi (1999) discussed the importance of total concentration on the task at hand,

> When goals are clear, feedback immediate, and your abilities [are] engaged by an appropriate challenge, you still need all the attention you can muster to attend to what must be done. Focus in flow is complete and purposeful, with no extraneous thoughts distracting from the task at hand. Concentration is a critical component and one of the characteristics of optimal experience mentioned most often (p. 23).

In this study, I examined the effect of an Imagery intervention targeted on concentration on the task at hand in order to promote flow and increase shooting performance compared to a Video placebo condition that displayed game play from the highest level of basketball in the world (US NBA league), with shooting removed. The Imagery condition showed a strong effect on all nine flow dimensions and 2-point basketball shooting, but not 3-point shooting. Total concentration is a key aspect of flow, which is often described as the experience of being totally immersed or absorbed in an activity (Engeser, 2008; 2012). It would be expected that an imagery-training program that was effectively designed to promote a focus on the task of basketball shooting would have a strong impact on the flow state dimension of total concentration, as well as enhancing global flow state. These outcomes were supported in the present study. Csikszentmihalyi (2000) stated that there are many activities that can encourage the occurrence of flow. Kimiecik and Stein (1992) referred to flow theory being task-involved, that should enable athletes to focus more on the task at hand, indexing the ability to get absorbed in an activity. Thus, this could lead to enjoyment of the activity based on the characteristics of flow experience, higher levels of concentration, and a feeling of being in control.

The flow literature and research would suggest that promoting a state of increased concentration is likely to produce flow experience and improved levels of performance. Eklund (1994; 1996) stated that deep concentration and a sense of control are flow characteristics that can facilitate performance. For example, flow is a highly functional state and should result in improved performance by itself. Athletes develop greater levels of skills whenever they master challenges in their activities. Rhodes and Kates (2015) also found that flow has enhancing potential in sports and physical activity promotion given the significance of positive affective experience for long-term participation. Kimiecik and Harris (1996) proposed that this autotelic experience helps athletes to enjoy their sport, not because of any expectation about future benefit, rather because of the intrinsic motivation that stems from having done an enjoyable and satisfying activity. Jackson (1992; 1995) suggested that the attribution of enjoyment is a consequence of flow. The perception of performing perfectly is another component of enjoyment and a result of being in flow. Following a flow experience, athletes report being left on a high, feeling great, and having experienced something extremely rewarding (Jackson &

Csikszentmihalyi, 1999). For this reason, the Imagery intervention designed to enhance the flow dimension of total concentration on the task was expected to have a positive impact on global flow and the total concentration flow dimension, which was shown to be the case by the results. Interestingly, the Imagery intervention also had a significant effect on the other eight flow dimensions, which was not predicted.

Koehn et al. (2013) confirmed that imagery training tailored to a specific task, or psychological variables associated with a task, can be a major factor in improving flow. Koehn et al. identified CS, CG, and MG-M functions of imagery as specifically related to several flow state dimensions, including total concentration. The tailored imagery script they devised to enhance five flow dimensions that corresponded to the antecedents examined in the present thesis facilitated flow state, as well as tennis service and groundstroke performance. There are many reasons for the potential of imagery to facilitate flow. Imagery training can help athletes to become clearer and focused on their goals through repeatedly rehearsing the process of performing the task and experiencing a positive final outcome. Practising imagery using the kinaesthetic sense, in the Koehn et al. study, also allowed athletes to generate feedback associated with performing the task correctly, especially in connection with body movement.

The shooting performance results in the present study revealed a significant difference in 2-point, and total shooting in the Imagery condition between pre-test and post-test. A 2-Way, Mixed-design ANCOVA was employed to compare the 2-point shooting score differences between the conditions on different occasions. Analysis revealed a significant occasions main effect, with a close to significant conditions main effect, and a significant interaction effect. The means of the total shooting scores also showed a significant main effect of occasions and a significant interaction effect. The results indicate that the Imagery condition showed a significantly larger increase in performance than the Video condition for total shooting. Thus, the effect for total performance is due primarily to the large increase in 2-point imagery scores because there is no difference in 3-point shooting between the Imagery and Video conditions. The intervention for enhancing total concentration described imagery in which participants imagined they were totally focused on shooting basketballs. Because participants were competitive players with at least moderate skill levels, I instructed them to focus on their usual routine for shooting baskets. They were not directed to focus on skill production because, at their skill level, the shooting skill should be automatic. Thus, a focus on the skill production would be likely to lead to a switch to controlled processing with an accompanying decrement in performance (e.g., Mesagno et al., 2009).

Carboni et al. (2002) found a significant effect of brief imagery on free-throw shooting performance and concentration style of intercollegiate basketball players. The Carboni et al. study focused on the popular sport of basketball, where the effects of brief imagery sessions prior to free-throw shooting were examined. Effects on concentration scores through the Basketball Concentration Survey, which was devised by Bergandi et al. (1990), as well as individual players' self-efficacy in their ability to shoot free throws were analysed. The participants in the Carboni et al.'s study were six current (at the time of the research) or former Division I basketball players from a US university. The mean age of the participants was 20.3 years, and their average playing experience was 10.3 years, as their experience ranged from 3 to 18 years. Single-subject design methodology was the primary approach for this investigation, as it allowed the researchers to analyse individual changes in performance as opposed to being limited to only observing group variations in performance. After they were given a warm up, each player was asked to estimate how many of the 50 free throws they would be able to shoot. In the initial session, participants were instructed to achieve a relaxed state of mind and then to visualise themselves shooting 10 free throws accurately. The remainder of the study saw each basketball player undergoing a 5-minute session of imagery prior to their shooting of 50 free throws. In conclusion, it was found that Basketball Concentration Survey scores showed no consistent increase or decrease among the participants. Additionally, external factors, such as pressure and stress, were attributed as a possible explanation for some of the decreases in free-throw scores. Carboni et al. reported that five of the six players rated that the imagery was useful for their performance and stated that they would continue to use the imagery after the conclusion of the intervention.

In the present study, the Imagery intervention that focused on total concentration was effective for 2-point shooting, but it did not affect 3-point shooting. One explanation for this might be the limited variation in the set of playing positions in the sample of basketball players. Most participants in the Imagery and Video conditions were players who had experience in the centre position. Players in the centre position in basketball normally play near the baseline, close to the basket and take 2-point shots near the ring. So, in general, not many basketball players in these positions have the opportunity to shoot successful 3-point shots on a regular basis.

The Video placebo condition had no significant effect on global flow state, flow state dimensions, or basketball shooting performance. In this research, I found that watching elite competition basketball games did not have any significant impact on participants' flow experience and shooting performance. The difference between the Video condition in the present study and the Video condition in Study 1 was that the video excerpts in Study 1 only showing basketball players shooting successful 2-point and 3-point shots, whereas the Video condition in the present study showed game play, but no shooting. Hence, the Video condition in the present study may not have had the same effect on performance as the videos in Study 1 because the present study did not include the opportunity for participants to observe and model 2-point and 3-point shooting, as I had removed shooting from the videos in this study.

Methodological Issues and Limitations

A limitation of examining shooting in training conditions was that participants took their shots in two blocks, first 2-point and then 3-point shots. One problem with this is that, in matches, opportunities to shoot occur at random times separated by other game action. This makes it more difficult to attain and maintain a shooting rhythm in games. Next, in games the opportunities for shooting 2-point and 3-point shots come up at random, increasing the variation, whereas the shots in this study were in 2-point and 3-point blocks, making it easier to settle into a rhythm related to the target distance. Thus, it would be valuable to examine the effects of an imagery script, focusing on 2-point and 3-point shooting on shooting performance in real basketball competition conditions.

The sample size was relatively small, but it was based on a power analysis and clear-cut significant differences arose for all nine flow state dimensions, and the performance results were strong and clear, so for the analysis conducted in this study it appears that the sample was adequate. The limited sample size precluded the use of modelling techniques (SEM) to examine the causal relationships between imagery, flow, and performance. Larger sample research would be valuable given the suggestive effects in the present study. In the previous study, with a similar design (Study 1), the use of video of NBA players shooting baskets was not an effective placebo because incidental, observational learning produced performance effects similar in size to those in the Imagery condition in Study 1. In the present study, the choice of video of NBA general game play, excluding shooting, as a placebo control condition seemed to work more effectively with little systematic increase in flow or performance in the Video condition, but there was the same amount of time commitment for the placebo condition as for the imagery condition, that is, six 15-minute sessions.

As in Study 1, the focus of the present study on basketball shooting limited the generalizability of the results and conclusions of the present study. Basketball shooting is a popular task for research on psychological factors that affect performance mainly because of the relatively straightforward measurement of performance (Fazel et al., 2018; Kanthack et al. 2014). The conduct of equivalent studies with a range of other sports tasks, especially focusing on discrete, self-paced skills, like golf putting, soccer penalty taking, pistol shooting, archery, and ten-pin bowling, would examine whether the present results are replicable in a range of sport contexts. Extension of this kind of research to sports that involve complex sets of tasks, performed under time pressure (i.e., externally-paced tasks), such as racquet sports and team ball sports, would certainly present greater challenges.

Further Research

The aim of this study was to examine whether an Imagery intervention that focused on total concentration on the task at hand, in this case basketball shooting, would increase participants' experience of global flow state, the total concentration flow dimension, and 2-point and 3-point shooting performance. I also examined the effect of the intervention on the other eight flow state dimensions, compared to a Video placebo condition. Although the results were promising in terms of global flow, total concentration and 2-point and total basketball shooting, this is one of the first studies to examine the effect of imagery in this context and to study the impact of imagery on flow dimensions, as well as global flow state. Thus, there is great potential for further research on this question.

One finding of the present study was that despite a careful matching process, participants in the Imagery condition appeared to have longer experience of playing competitive basketball than those in the Video condition, generally practised for more hours per week than the Video condition participants, and practised shooting more during the two weeks of the study than those in the Video condition. These differences were surprising given the way in which participants were matched in pairs from within specific teams and based on their playing positions. Given the size of the differences in these important demographic variables, including a significant difference for basketball shooting practice, even more care needs to be taken in future to match participants between conditions. The playing level range might also be a factor to consider controlling more tightly in future, that is, perhaps there are noteworthy differences between the skill levels of players in Divisions A, B, and C. Thus, future research should aim to recruit participants from one division for a specific study. Perhaps there are especially big variations, even within the division, between Division A players. This because some players are coming "down" from high-level competition toward the end of successful playing careers, whereas others, particularly younger players, are aspiring to the higher levels, so they are still developing and improving.

Focusing on issues related to the delivery of imagery training in general, research remains limited on the amount of imagery that is most effective to produce various effects on psychological variables, for example, global flow and specific flow states, and behaviour, such as performance. Studying the optimal amount of imagery training for specific psychological and behavioural outcomes is important to ensure that sufficient imagery is provided to attain the desired effects, whereas athletes' time is not wasted by extending imagery programs beyond effective amounts. Several aspects of imagery programs should be considered in this respect. These include the duration of imagery sessions, the frequency of imagery sessions per week, and the total number of sessions that comprise imagery programs. In the present study, the duration of each session was 15 minutes, the frequency of sessions per week was three sessions, and the imagery-training program continued for two weeks. This combination is probably shorter than typical imagery programs reported in previous research. Duration of sessions is often between 10 and 20 minutes (Munroe-Chandler & Hall., 2004; Munroe-Chandler et al., 2005). Three sessions per week has probably been the most popular frequency, although two and four sessions are common (Munroe-Chandler et al., 2000). However, most programs continue for three, four or more weeks, making the present program somewhat short. Nonetheless, the imagery-training program in the presents study did produce strong results. Further research should consider whether this amount of imagery is optimal or whether longer or shorter sessions (duration), more or less frequent sessions (frequency), or a larger total number of sessions, would be more effective. This could be done using the same design as I employed in the present study and the previous study, so that variation in other factors that could affect the impact of imagery are limited across studies, which focus only on varying and examining the duration, frequency, or number of sessions.

Another issue that has not been researched sufficiently in the context of flow in particular is the content of imagery programs. A key aspect of the content of imagery scripts designed to enhance psychological variables, like flow, and behavioural variables, like performance, in the context of sport is the extent to which they focus on aspects of process and outcome. In the present study, I devised an imagery script that was intended to encourage basketball players to imagine the process of basketball shooting and the outcome of each shot to enhance total concentration. It is possible that focusing on the outcome of shots might be detrimental to concentration, which is primarily concerned with the process of performing the skill. In studies of the phenomenal experience of flow, researchers have reported that thinking about outcomes runs the risk of disrupting flow state (Russell, 2001; Young, 2000). Studies could be conducted in which an imagery script like the one employed in this study is compared with a script that focuses entirely on the process of performing basketball shooting to examine the impact this has on global flow state and the total concentration dimension of flow. A subsidiary issue with such a research design could be to examine the impact of the two imagery scripts on the clear goals and unambiguous feedback dimensions of flow, which I would expect to be enhanced more by imagery of the outcome of basketball shooting. This raises the interesting possibility that different imagery content with respect to process and outcome could have different effects on various flow dimensions.

With respect to performance, the content of imagery programs is also an important issue to be studied further. In the present study, I have argued that both imagery of the process of basketball shooting, which should improve players shooting technique, and imagery of the successful outcome of the shots that players imagine, which should enhance confidence, should contribute to superior actual performance. Thus, as noted in the previous point, studies in which the focus is on imagery of the process of performing, with no elements of the imagery script referring to successful outcomes, or increases in confidence that result from imagining successful outcomes, might not be as effective as imagery programs that include both process and outcome components. In studies it would be possible to compare outcome-free imagery scripts, with process-free scripts that only include instructions for imagery of success, paying no attention to the process, and imagery scripts that include both process and outcome elements.

An interesting idea raised by this discussion is the possibility that there could be a conflict between the optimal imagery script to promote global flow and at least some flow dimensions, and the optimal script for enhancing performance. Studies that measure both flow dimensions and performance with designs similar to those described in this discussion might reveal patterns that reflect a bias toward flow and away from performance or favouring performance at the expense of flow dimensions in imagery scripts that vary in their content. For example, imagery scripts that focus primarily on the process of performing and the associated psychological states might be expected to enhance flow perhaps at the expense of improving performance, whereas imagery scripts that describe how the process of performance leads to the desired outcome, emphasizing attainment of that outcome, would be expected to have a stronger impact of performance, perhaps at the expense of flow.

In the present study, as predicted, I found that the targeted antecedent flow state dimension of total concentration was enhanced significantly more by the total concentration imagery script presented in the Imagery intervention than by the Video Placebo condition. However, all the other eight flow state dimensions were also enhanced significantly more in the Imagery intervention than in the Video Placebo condition. One possible explanation for this is that, as an antecedent, total concentration enhances other flow state dimensions, especially the concomitant flow state dimensions. Further, it is possible that total concentration, which appears to be similar to the concepts of immersion and absorption that have been used to define the essence of the flow experience, could promote the other flow state dimensions, including the other four antecedents. Before considering ways to examine whether either of these possibilities is the case, studies should be conducted that replicate the design of the present study to determine whether imagery interventions that focus on total concentration consistently enhance all the other flow dimensions or whether the finding in the present study needs to be explained in a different way. Such studies could be conducted in basketball shooting, as well as in a range of other target sports, including netball shooting, golf putting, pistol shooting, archery, and ten-pin bowling. Analyses of the flow state measures, such as the FSS-2, should focus on the flow state dimensions, not just examine global flow state.

It is possible that research that replicates the present study might find consistent patterns of enhancement of certain flow states, but other flow states that are not consistently enhanced by imagery interventions that focus on total concentration. For example, it might be that the flow state concomitant dimensions are consistently enhanced. In this case, it would then be possible to design studies to confirm that interventions designed to enhance the total concentration flow state dimension, also enhance the concomitant flow dimensions. Interventions that might be examined include self-talk and hypnosis, each with a focus on enhancing total concentration and measuring the impact of the intervention on all nine flow state dimensions, as well as global flow state, ideally, compared to placebo conditions that are perceived to be meaningful to participants.

In the event that replication studies do find relatively consistent patterns suggesting that interventions designed to enhance the total concentration flow state dimension are associated with enhancement of the other eight flow dimensions, one way to explore the possible causal relationship between total concentration and other flow state dimensions would be to conduct longer duration studies with multiple measures of flow state dimensions. In such studies, imagery interventions, designed to enhance total concentration, could extend, for example, to six or eight weeks, with two imagery sessions each week. Global flow state and the nine flow state dimensions could be measured after the second session each week. It would then be possible to examine whether the total concentration flow state dimension is enhanced before the other flow dimensions, as well as which of the other dimensions increased first or whether they all increased at the same time. Researchers could also test the duration of the lag between the increase in total concentration and changes in the other dimensions, if there was a delay.

Despite all the research that has employed the FSS/FSS-2 during the last 20 years, measuring flow state meaningfully, including understanding the relationship between global flow and the nine flow state dimensions, as well as the relationships between the dimensions, is still a challenge. Studies in which flow state is measured on multiple occasions have potential to throw further light on these issues, but they cannot be definitive. To establish causal relationships between flow state dimensions and between each dimension and global flow state, causal modelling studies are desirable. Such studies could use similar designs to the longer duration intervention studies just described, including multiple measures of flow state. However, they would involve much larger samples to permit the use of statistical methods that provide causal models of the relationships in question. Such studies should be able to test whether total concentration acts as a mediator between interventions, such as imagery training focused on total concentration, and the other flow state dimensions and global flow state, or whether such imagery training independently affects a number of different flow state dimensions.

Measuring and focusing on analysis of the flow state dimensions certainly seems to have potential to contribute to unravelling important unanswered questions about the role of the flow state dimensions in the flow experience. I acknowledge that this is a challenge that is only initiated in the present study, but the present focus on examining flow state dimensions is suggestive.

Conclusion

In this study, I investigated the effect of an Imagery intervention that focused on concentration on the task at hand on global flow, flow dimensions, and basketball shooting performance compared to a Video placebo condition. Examination of the means for flow state dimensions indicated that self-reported flow increased from pre-test to post-test for all nine flow dimensions in the Imagery condition, but there were limited increases for the Video condition. Two-Way, Mixed-design ANCOVA indicated that there were significant main effects of conditions for the Imagery condition for unambiguous feedback, sense of control, loss of self-consciousness, and time transformation, while concentration approached significance. There were significant main effects of occasions for all nine flow dimensions. There were significant interaction effects for all nine flow dimensions, all indicating that flow increased more in the Imagery condition than in the Video condition.

I found significant effects of the Imagery and Video Conditions on shooting performance. This indicated that performance increased substantially from pre-test to post-test for 2-point and total shooting in the Imagery condition, but results showed little or no increase for the Video condition. For 3-point shooting, both Imagery and Video conditions showed small and equivalent increases. Two-Way, Mixed-design ANCOVA indicated that the main effect of conditions was not significant for 2-point, 3-point, or total shooting. The main effect of occasions was significant for 2-point and total shooting. The conditions x occasions interaction effect was also significant for 2-point and total shooting, but not for 3-point shooting, indicating that performance in the Imagery condition increased more from pre-test to post-test than in the Video condition for 2-point shooting and total shooting.

The conclusions for flow dimensions were that flow increased significantly more from pre-test to post-test for all nine dimensions following the Imagery intervention than it did for the Video condition, including the targeted dimension of total concentration on the task at hand. It is not clear why the eight flow dimensions not targeted showed significant increases, but it might be that it is difficult for individuals to distinguish between changes in specific dimensions in the phenomenal experience of an increase in flow. Improved understanding of the proposed antecedents and concomitants of flow could be supported by further research to examine individuals' capacity to detect and report the effects of flow dimension-specific interventions, based on measuring and analyzing all nine flow dimensions, using a questionnaire like the FSS-2. Such research should also include qualitative elements to explore the experience of flow dimension change in a more specifically-targeted manner.

Performance of 2-point and total shooting increased significantly more in the Imagery intervention condition than in the Video condition**.** The Imagery intervention specifically included imagining performing shooting well (process) and shots being successful (outcome), which were intended to enhance performance**.** It is not clear why 3-point shooting did not increase substantially in the Imagery condition. It is possible that participants found 3-point shooting more challenging. The mean performance for 3-point shooting was 10 points lower at pre-test than for 2-point shooting and nearly 20 points lower at post-test.

Overall, the results of the present study are promising for the use of imagery as a technique to enhance aspects of the flow experience, including global flow state. Measurement of flow dimensions was instructive, although questions remain about how dimension-specific imagery interventions appear to enhance all nine flow dimensions. Further, the impact of imagery interventions on performance was supported once again. However, the question of causal relationships between flow and performance remain for larger-scale and more sophisticated modeling research.

CHAPTER 5

STUDY 3: THE EFFECTS OF A RELAXATION AND CONFIDENCE IMAGERY INTERVENTION TO ENHANCE FLOW EXPERIENCE AND INCREASE SHOOTING PERFORMANCE

Introduction

Enhancing flow is an important goal in sport because of its link with higher levels of performance in athletes (Jackson, 1996). Researchers have also found confidence and anxiety levels to be significant variables related to flow experience (Koehn et al., 2013). Once a skill is well, athletes normally experience increased confidence and reduced anxiety, at least with respect to learning that skill (Bandura, 1986). To experience flow in practice and competition, athletes should be able to concentrate on the task at hand, experience merging of their actions and awareness, perceive a sense of control over the situation, and feel confidence that their skill set matches the challenge of the situation (e.g., Conroy & Metzler, 2004; Hatzigeorgiadis & Biddle, 2008; Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis, 2009; Swann, Keegan, Piggott, & Crust, 2012). Sense of control, usually described as a feeling of calmness and confidence about performance in the present context, is one of the most critical components of the flow experience, whether or not an objective assessment justifies such feelings (Csikszentmihalyi & Jackson, 1999). It is the subjectively perceived opportunities and capacities for action that determine experience (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2005). Stavrou and Zervas (2004) proposed that sense of control is an antecedent flow state dimension of the experience of flow. In this study, I investigated the use of imagery to enhance aspects of flow state related to sense of control that are likely to support basketball players' shooting performance. This involved imagining feeling calm and confident during basketball shooting performance. Thus, this study focused on imagery of relaxation and confidence in basketball players.

Method

Participants

Based on power analysis with a .05 significance level, large effect size, and 70% power, I recruited 30 basketball players (16 male, 14 female) from a Melbourne domestic league competition. They were all volunteers, who completed a standard consent process. All the players who volunteered for this study met the inclusion criteria, so there were no volunteers who were excluded. The mean age of the basketball players who participated in the study was 26.33 years old (*SD* = 6.09). The mean age of participants in the Imagery condition (*n* = 15) was 24.00 years old (*SD* = 4.42) and the mean age of participants in the Video condition (*n* = 15) was 28.66 years old (*SD* = 6.75). Participants in the Imagery condition had 7.66 years (*SD* = 4.32) of playing experience in competitive basketball, whilst those in the Video condition had 5.00 years (*SD* = 4.88) of playing experience. Participants undertook three sessions of basketball training per week. Those in the Imagery condition spent 4.46 hours per week training, compared to 6.13 hours per week for the Video condition participants. The Imagery condition participants in this study mostly played in Division A and some athletes played in Division C of the local basketball league and, of the Video condition participants, half of the players played in Division A and the other half played in Division B. None of the participants had previous experience of imagery training.

Study Design

I conducted this study with the same pre-test, intervention, post-test design for the Imagery intervention condition and Video placebo condition that I employed in Study 2 (see

Chapter 4). Participants first completed the SIAM (Watt et al.,2004), followed by the basketball shooting measure and the FSS-2 (Jackson & Eklund, 2002) at pre-test. Then I matched participants in pairs based on their demographic characteristics and I assigned one member of each pair at random to the Imagery condition and I assigned the other player to the Video condition. I presented participants in the Imagery condition with imagery of basketball shooting designed to promote a key antecedent of flow, specifically the sense of control dimension of flow, involving feelings of calmness and confidence. I presented participants in the Video condition with a placebo consisting of videos of high-level male and female basketball competition (USA National Basketball Association), with general game play. I asked the participants in both conditions to complete an intervention logbook that indicated the dates and times when they completed the sessions, along with any additional comments on their experiences and feelings during the sessions. This acted as a manipulation check. Participants in both conditions completed six 15-minute sessions over a 2-week period. I chose to use 15 minutes for the duration of the Imagery condition and the Video condition because this is an imagery duration that has previously been found to be effective for this kind of task (Hinshaw, 1991). I also asked participants in both conditions to complete a basketball-training diary reporting their training sessions during the intervention period that included basketball shooting. I then conducted the basketball shooting and FSS-2 post-tests. Finally, all participants undertook a short debriefing interview as part of the manipulation check.

Measures

The study included a Demographic Form to collect relevant demographic information, and I screened imagery ability to ensure moderate to high ability on key imagery dimensions and sense modalities. I assessed information on the intensity of flow experience and measured basketball shooting performance. I also monitored adherence to intervention conditions with an intervention logbook and basketball shooting training with a diary, as well as conducting debriefing interviews.

Demographic Form. As described in Study 1. The demographic form is presented in Appendix D.

Sport Imagery Ability Measure (SIAM; Watt et al., 2004; Watt et al., 2018). As described in Study 1. The SIAM is presented in Appendix E.

Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002). As described in Study 1. The FSS-2 is presented in Appendix F.

Basketball Shooting Performance. As described in Study 1. The scoring sheet is presented in Appendix I.

Intervention Logbook. As described in Study 1. The format of the intervention logbook is presented in Appendix H.

Basketball Training Diary. As described in Study 1. The format of the training diary is presented in Appendix L.

Debriefing Interviews. As described in Study 1. The guide for the social validation interviews is presented in Appendix J.

Interventions

Imagery condition. The Imagery intervention was created to incorporate best practice of imagery design to guide development of the imagery based on relaxation and confidence principles. Sense of control is about feeling calm (relaxed yet alert) and confident Csikszentmihalyi & Jackson, 1999). Thus, the imagery script focused on sensations associated with feeling relaxed. Those sensations also focused on the task. In addition, the script promoted feelings of confidence, reinforced by imagery of successful shooting as the session continued, thus, enhancing confidence in performance of the shooting task over the course of a session and from session to session. For example, in this study, participants undertook imagery that emphasized feelings of confidence. They felt in control and thought about experiencing a positive attitude or confidence in the belief that they could achieve the goal that they had set for the imagery task. Following is an example of the first part of the imagery script for Study 3, involving sense of control,

> In this session you will be guided to relax because relaxation helps people to produce effective imagery. Then you will imagine that you are standing at one end of your usual training court and that you are going to shoot baskets from 2-point and 3-point positions. You will imagine feeling relaxed, yet alert, so you feel calm about performing the task. In addition, you will imagine feeling really confident about achieving the goal you have set. [*Insert here the goal number of successful shots for this participant*] is a challenging score out of 80, but you believe you can achieve that number of baskets. After imagining the first few shots of the task, we will move the imagery to the last few shots out of 80 that need to be successful for you to achieve your goal. Again, you will imagine each shot going through the ring, while you feel calm and confident.

Participants completed six imagery-training sessions over a 2-week period, each session lasting 15 minutes. They were required to imagine shooting eight 2- and 3-point shots from each of the two distances and five angles used in the performance test. The imagery sessions were conducted on Monday, Wednesday, and Friday of each week, with the key aspect of the script in this study being imagining attaining sustained concentration on shooting performance. At the end of each session, participants completed a logbook to indicate the dates and times when they completed the imagery sessions and added any comments on their experiences during the sessions. The basketball coach of the team that the players came from and a PhD researcher who was also an international level basketball player and referee gave feedback that helped to finalise the scripts. The script for the Imagery intervention condition is presented in Appendix G.

Video placebo condition. The 15-minute video sessions were conducted on Monday, Wednesday, and Friday of each week for two weeks, so duration of participants' involvement was the same as participants in the imagery condition. The video sessions showed expert basketball players from the US National Basketball Association (NBA) playing in general game competition. I chose games from the Finals Series of the USA NBA (2017) because they are especially exciting and interesting. Participants were given a different video to watch in each session. I presented participants in the Video condition with basketball videos of elite players performing in competition matches demonstrating all the skills of elite basketball, include shooting. Of course, it is helpful for developing players to watch highly-skilled performance of each basketball skill. Watching how players dribble, pass, find space, shoot and move around the court all provide valuable information. In training players could learn by watching any of these skills separately or in combination. The intention was that participants in this condition would perceive the task they were performing to be relevant to their basketball performance. Based on the results of Study 1, where it appeared that participants in a basketball shooting Video condition improved their shooting due to incidental observational learning, there was not only successful shot shooting skill in the videos shown in the present study. I gave participants in this condition no instructions about what to do during the 15-minute sessions other than to watch the video. I presented an introduction to participants in the Video condition, lasting the same length of time as the Imagery condition introduction, about the importance for the research of carefully following all the instructions and at the same time enjoying watching the best basketball players in the world performing a range of skills in the videos.

Procedure

Prior to commencement, the research received approval from the Victoria University Human Research Ethics Committee. I recruited participants who were league basketball players with permission from their basketball clubs in Melbourne, Australia. Players read an Information Statement describing the purpose of the study and all the procedures (Appendix B). Players who wished to participate in the study as volunteers signed the provided consent form (Appendix C). At my initial meeting with potential participants, I administered the Demographic Form and the SIAM to select moderate- to high-ability imagers. Then all participants completed the basketball-shooting task, shooting 40 2- and 3-point shots from each of the two distances (i.e., 4.5 metres, 6.75 metres) and five angles (i.e., 90 degree to end line, 60 degrees to end line on left and right, 30 degrees on left and right) used in the performance test. After that, I matched players on demographic variables and assigned the participants from each pair to the Imagery or Video condition at random until there were 15 participants in each condition. Once they had completed the performance pre-test, which entailed the 80-shot 2- and 3-point basketball shooting performance task, I gave the participants up to 30 minutes to fill out the FSS-2. I gave all participants a basketball training diary and asked them to complete it for every basketball training session that included shooting practice during the intervention period. Then I delivered six imagery or video placebo sessions over two weeks. I instructed participants in the Imagery condition to use imagery for 15 minutes in each of the six sessions, as prescribed in the imagery script. Participants took part in imagery rehearsal or watched successful basketball shooting for 15 minutes three times a week on Mondays, Wednesdays, and Fridays for two weeks. I asked them to complete the intervention logbook at the end of each session, noting the date and time of each session, and commenting on their experiences of imagery or watching videos as a manipulation check. Following the six sessions of imagery or video, I conducted the post-test on basketball shooting performance. Then after 5 to 10 minutes rest I asked participants to complete the FSS-2 and allowed them up to 30 minutes to complete the scale. At the end of the study, I conducted a short debriefing interview with each participant on their flow and intervention experiences. We also shared information on their perception of their performance during the study. Then I thanked the players for participating in the study.

Analysis

I examined the manipulation check data in the intervention logbook and the comments that were made during the short debriefing interview to ensure that participants followed the instructions they were given, including carrying out the assigned intervention condition to the best of their ability. During the next phase of data analysis, I used independent-samples t-tests and 2-Way, Mixed-design ANOVA. First, I conducted T-tests to compare the Imagery and Video conditions on the 12 SIAM subscales at the pre-test stage and to examine whether there was any difference in imagery ability between the two conditions, which might have introduced bias into the results for flow or basketball shooting performance. I also conducted independent-samples T-tests on the basketball competition experience data from the Demographic Form and the basketball shooting training time during the interventions from the Basketball Training Diary to check whether there was any difference between the Imagery and Video condition participants in prior basketball experience or current training that could have influenced their post-test flow state or performance. Next, I conducted 2-Way, Mixed-design ANOVA to compare the Imagery and Video conditions on global flow state and all nine flow state dimensions, in which experimental conditions (Imagery, Video) was the independent groups factor, occasions (pre-test, post-test) was the repeated measures factor, and conditions x occasions was the interaction factor. Third, I tested 2- and 3-point basketball shooting performance, using similar 2-Way, Mixed-design ANOVAs. I also examined participants' intervention logbooks further for additional evidence of their experiences throughout the study. Finally, I examined participants' short debriefing interviews further to gain greater depth of understanding of their experiences in the study.

Results

Manipulation Check

In the study, the manipulation check was conducted with the 15 basketball players who had been assigned to each of the conditions, Imagery and Video. Once the data had been collected, the first step in dealing with the results was to conduct the manipulation check. This was done by examining the logbooks and social validation interviews to ensure that the participants undertook the interventions to which they had been assigned. The participants' responses indicated that all 15 participants in the Imagery intervention completed all six imagery sessions and all 15 participants in the Video Placebo condition completed the six video sessions. Among the basketball players, all the athletes had been playing for more than five years in Melbourne Local League Competitions. All the athletes indicated that, during the intervention phase of the Imagery intervention, they had made a sustained effort throughout imagery sessions and the performance tests. Furthermore, all athletes felt that the intervention had improved their performance and they enjoyed it. They also felt more relaxed, more focused, confident, and calm, and they experienced less stress, while they felt positive and motivated. Thus, I concluded that the manipulation checks supported retention of all participants in the analyses. Participants in the Video condition reported that they experienced enjoyment when watching the content from the basketball games in the Video intervention. All the information in the logbooks indicated that participants undertook all the sessions and followed the instructions for the research condition in which they participated. This information was repeated in the final debriefing interviews in which participants reported on their experience across the whole of the study. Again, participants indicated that they acknowledged and understood what they were asked to do as participants in the study and that they were able to carry out the instructions as intended. These manipulation checks provided confirmation that the interventions had worked as planned, so I conducted further analyses with all participants included.

Imagery Ability Screening

I administered the SIAM (Watt et al., 2004) as a screening device prior to the pre-test to check that potential participants had sufficient imagery ability to undertake the Imagery intervention and that participants in the Video intervention were equivalent in terms of imagery ability to Imagery intervention participants. This was in order to minimise any bias that might be associated with imagery ability. As shown in Table 5.1, the means on the four key factors of imagery ability, namely the visual and kinaesthetic sense subscales, and the vividness and control dimension subscales of SIAM, were all moderate to high. In addition, all potential participants presented at least moderate levels of imagery ability on these four key subscales. The results of independent-samples T-tests. showed no significant differences between the means for the Imagery intervention and the Video intervention on any of the four key imagery ability subscales or on means for the total SIAM score across the 12 SIAM subscales, so I concluded that all potential participants were suitable for the study and that there were no systematic differences between the two intervention conditions in terms of imagery ability. Nonetheless, it should be noted that participants in the Imagery condition did score higher on all four imagery ability dimensions than those in the Video condition.

Table 5.1.

Means and Standard Deviations, and T-test, F-values, and p-values of SIAM Scores for the Imagery Intervention and the Video Placebo Intervention

SIAM Subscales	CONDITION	*M*	*SD*	*F*	*p*
VISUAL	Imagery	302.87	21.07	3.11	.09
	Video	273.73	60.37		
KINAESTHETIC	Imagery	294.93	28.86	2.01	.16
	Video	274.20	48.74		
VIVIDNESS	Imagery	291.80	27.15	2.73	.11
	Video	265.53	55.22		
CONTROL	Imagery	294.07	23.80	1.62	.21
	Video	274.20	55.46		

Basketball Competition Experience and Training During the Study

I examined basketball competition experience from the Demographic Form and basketball training during the study from the training diary to determine whether these variables differed in a systematic manner that might affect flow or performance during the study. Analysis of basketball competition experience indicated that participants in the Imagery intervention reported a mean of 7.66 (*SD* = 4.32) and participants in the Video placebo condition reported a mean of 5.00 (*SD* = 4.88). T-test indicated that there was no significant difference between the two conditions, F (1, 28) = .29, p = .59, $\eta^2 =$ .08. Analysis of the training diaries indicated that participants in the Imagery intervention reported a mean of 4.46 (*SD* = 3.48) hours of practice involving shooting during the two weeks of the intervention and participants in the Video

Placebo condition reported a mean of 6.13 (*SD* = 5.43) hours of practice. T-test indicated that there was no significant difference between the two conditons, F (1, 28) = 1.61, $p = .21$, $\eta^2 = .03$. Because there was no significant difference between conditions in terms of basketball competition experience or basketball training during the study, I conducted analyses of global flow state, flow state dimensions, and basketball shooting performance at pre-test and post-test in the following sections, using Two-Way, Mixed-design ANOVA.

Global Flow State and Flow State Dimensions

The results for global flow state and the nine flow dimensions are presented graphically in this section. Then the results of the ANOVAs are presented in Table 5.2.

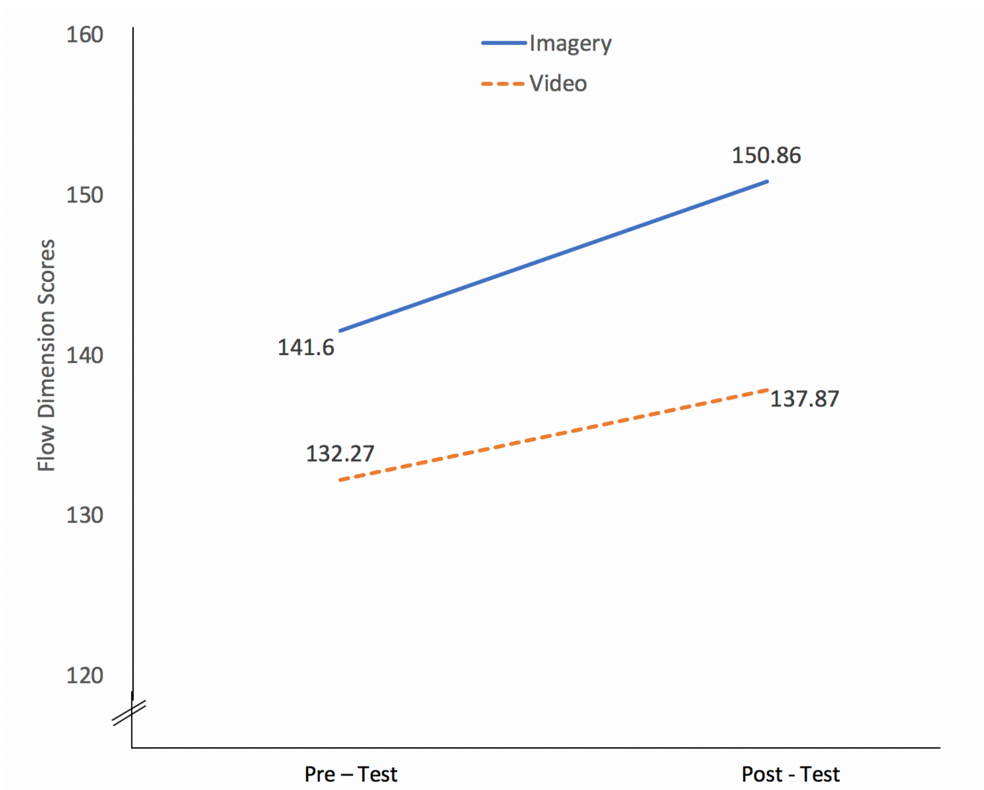

Figure 5.1 Mean Global flow state for the Imagery and Video conditions at pre-test and post-test

Figure 5.1 shows the means for the global flow state. Both conditions increased from pre-test to post-test, with only a small difference in slope, which was higher at pre-test and still higher at post-test for the Imagery condition than the Video condition. Two-Way, Mixed-design ANOVA revealed a significant main effect of conditions (p = .002), with a large effect size and a significant main effect of occasions (p < .001), with a large effect size, but there was no significant interaction effect (see Table 5.2). The main effect condition indicated that participants in the Imagery condition had significantly higher global flow than those in the Video condition across pre-test and post-test. The significant main effect of occasion indicated that participants in the study increased their global flow from pre-test to post-test, regardless of whether they were in the Imagery or Video Placebo condition. The absence of a significant interaction effect indicated that global flow state in the Imagery condition did not increase more than it did in the Video Placebo condition.

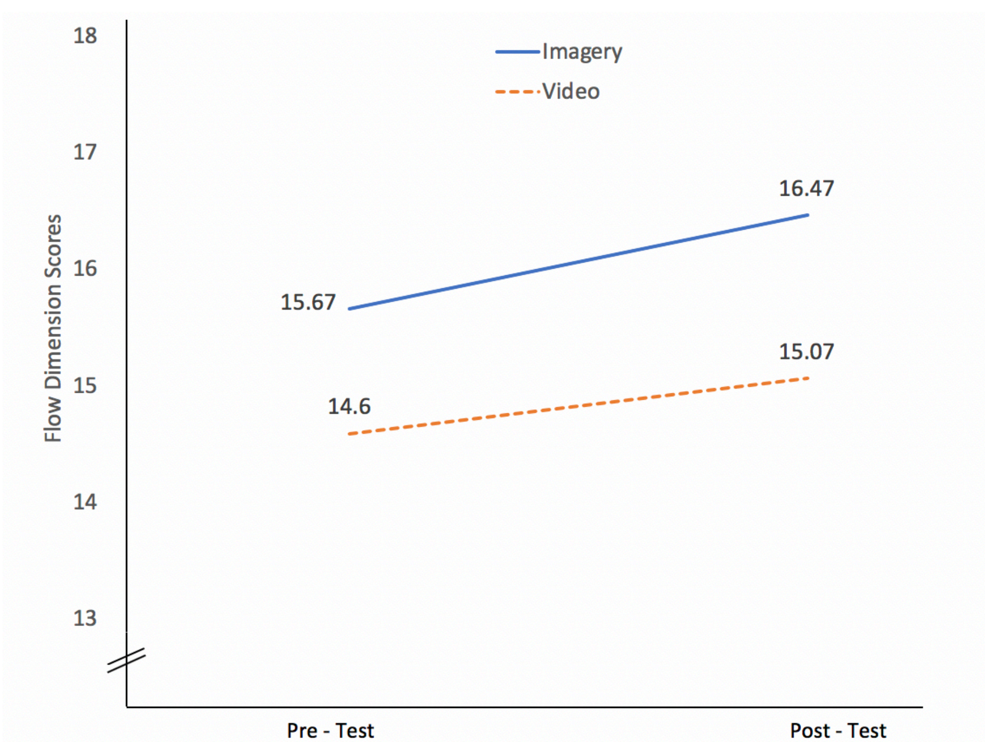

Figure 5.2. Mean C-S Balance for the Imagery and Video conditions at pre-test and post-test

Figure 5.2 shows the means for the C-S balance dimension for the Imagery and Video intervention conditions at pre-test and post-test. Figure 5.2 shows the graph lines to be almost parallel, which means of the C-S balance in the Imagery condition was higher at pre-test than it was in the Video condition, and it stayed higher at post-test. Two-Way, Mixed-design ANOVA, with an independent groups factor, conditions, with two levels (Imagery, Video) and one repeated measures factor, occasions, with two levels (pre-test, post-test) revealed a significant main effect of conditions (p = .04), with a small effect size, and a significant main effect of occasions (p = .05), with a small effect size, but no interaction effect. The significant main effect for conditions indicates that the Imagery condition had higher C-S balance throughout the study. The significant main effect for occasions indicates that the sample overall scored higher at post-test than at pre-test, that is participants increased C-S balance regardless of condition.

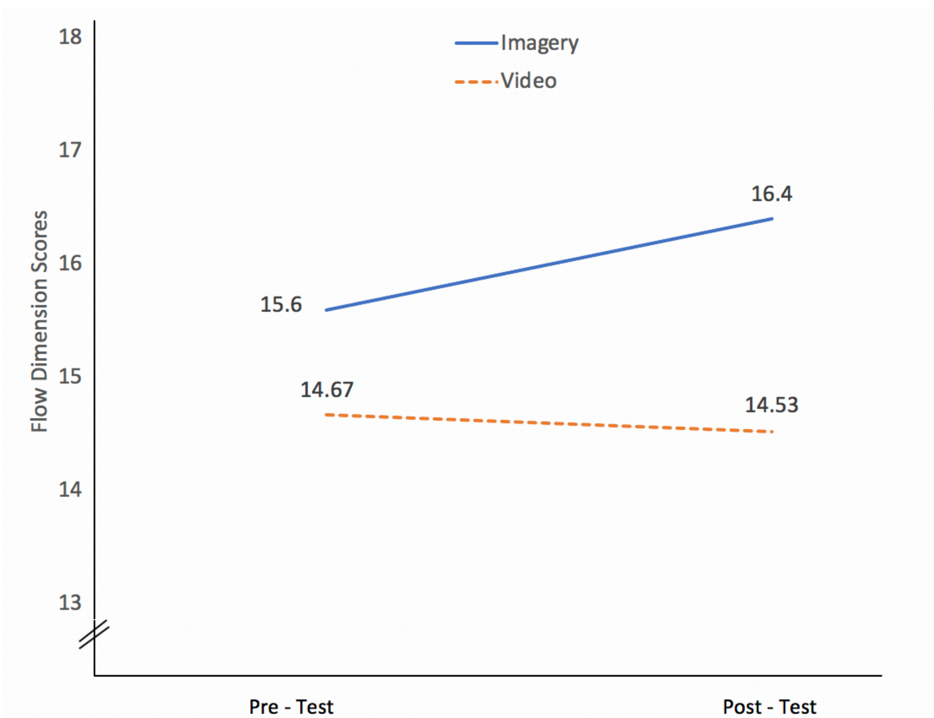

Figure 5.3. Mean Merging of Action Awareness for the Imagery and Video conditions at pre-test and post-test

Figure 5.3 shows the means for the merging of the action and awareness dimension of flow state, which shows a weak ordinal interaction. Flow increased in the Imagery condition from pre-test to post-test. Flow decreased marginally in the Video condition. Two-Way, Mixed-design ANOVA revealed a significant conditions main effect (p <.001), with a large effect size, indicating that the Imagery condition showed higher flow than the Video condition at pre-test and post-test. There was no significant main effect of occasions and there was no significant interaction effect despite the differences in slope between the Imagery and Video conditions.

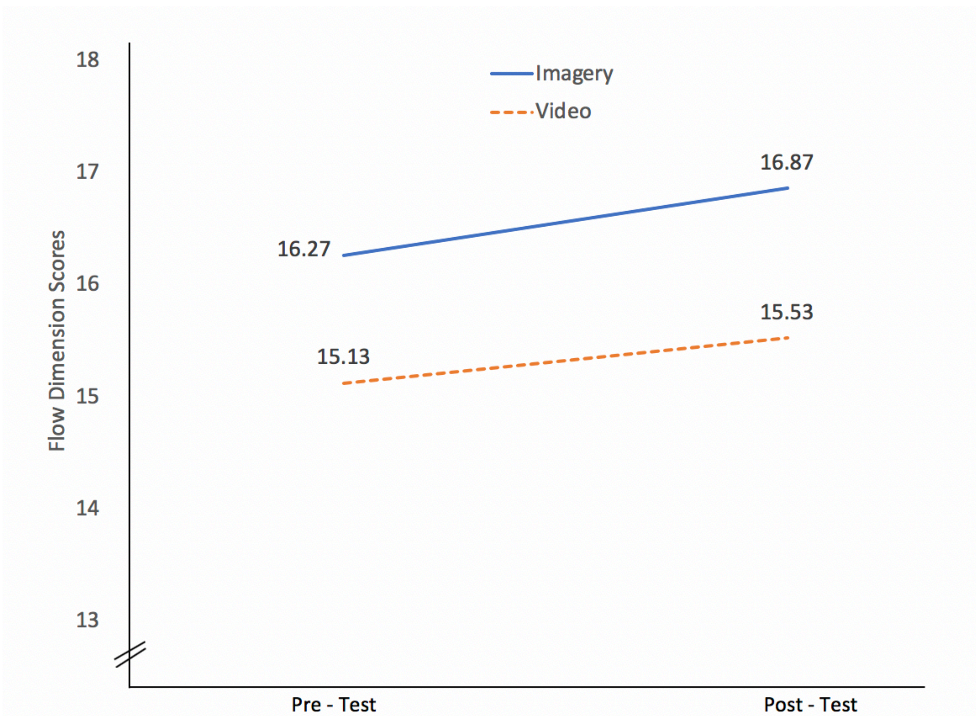

Figure 5.4. Mean Clear Goals for the Imagery and Video conditions at pre-test and post-test

Figure 5.4 shows the means for the clear goals flow state dimension for the intervention conditions and occasions. The graphs show that the Imagery condition was higher at pre-test and post-test than the Video condition. Both conditions increased a small amount from pre-test to post-test, so the Imagery and Video conditions were close to parallel. Two-Way, Mixed-design ANOVA revealed a significant conditions main effect (p = .04), with a small effect size, indicating that participants in the Imagery condition had significantly higher scores than those in the Video condition on the clear goals flow dimension at pre-test and post-test. There was no significant occasions main effect and no significant interaction effect.

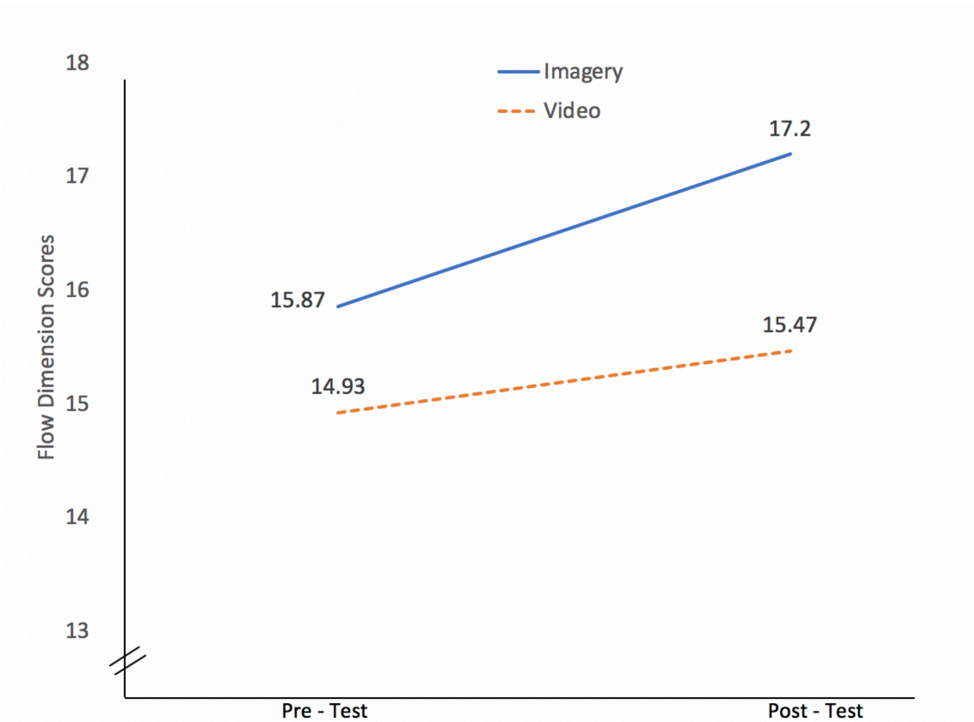

Figure 5.5. Mean Unambiguous Feedback for the Imagery and Video conditions at pre-test and post-test

Figure 5.5 shows the means for the unambiguous feedback flow dimension for the Imagery and Video intervention conditions at pre-test and post-test. The Imagery condition shows a slightly steeper slope from a higher position at pre-test. Two-Way, Mixed-design ANOVA for unambiguous feedback revealed a significant main effect of conditions (p = .01), with a small effect size, indicating that participants in the Imagery condition had significantly higher flow than those in the Video condition on the unambiguous feedback dimension across pre-test and post-test. There was also a significant main effect of occasions (p = .005), with a medium effect size, indicating that participants in the study increased on the flow dimension of unambiguous feedback, regardless of their condition. The results did not reveal a significant interaction effect.

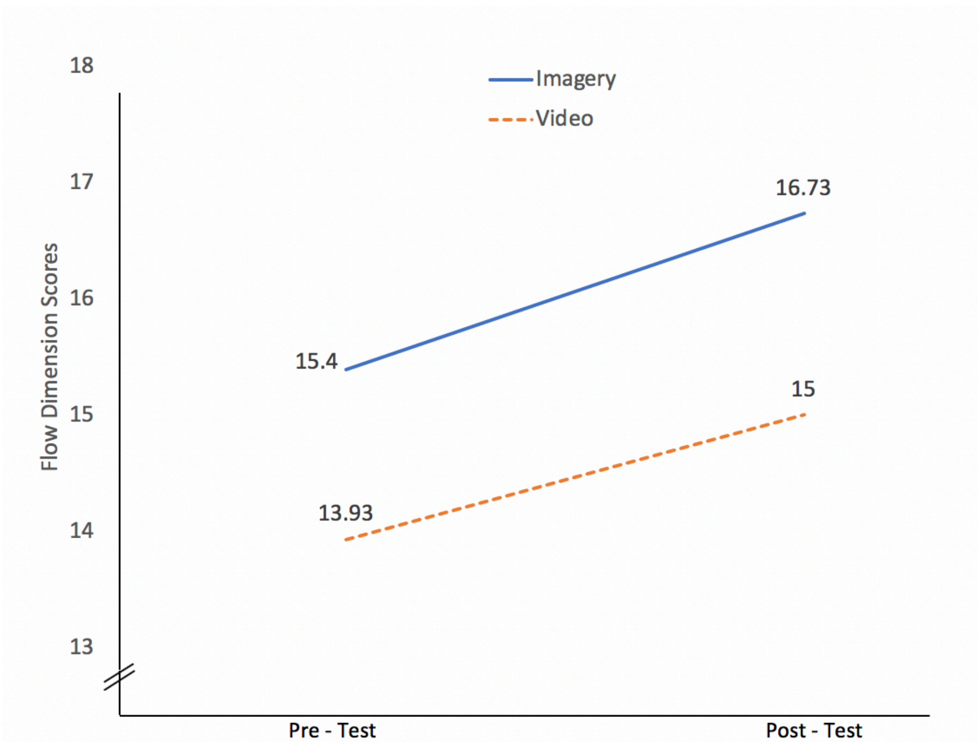

Figure 5.6. Mean Concentration on the Task at Hand for the Imagery and Video conditions at pre-test and post-test

Figure 5.6 shows the means for the concentration on the task at hand flow dimension for the Imagery and Video intervention conditions and occasions. The graph shows that the Imagery and Video conditions were almost parallel from pre-test to post-test. Means for the Imagery condition were much higher than those for the Video condition at pre-test and post-test. Two-Way, Mixed-design ANOVA indicated that for concentration on the task at hand there was a significant main effect of conditions (p = .01), with a small effect size, indicating that participants in the Imagery condition had significantly higher flow on the concentration dimension at pre-test and post-test than those in the Video condition. There was also a significant main effect of occasions (p = .004), with a small effect size, indicating that regardless of condition, participants increased their flow scores on concentration from pre-test to post-test. There was no significant interaction effect.

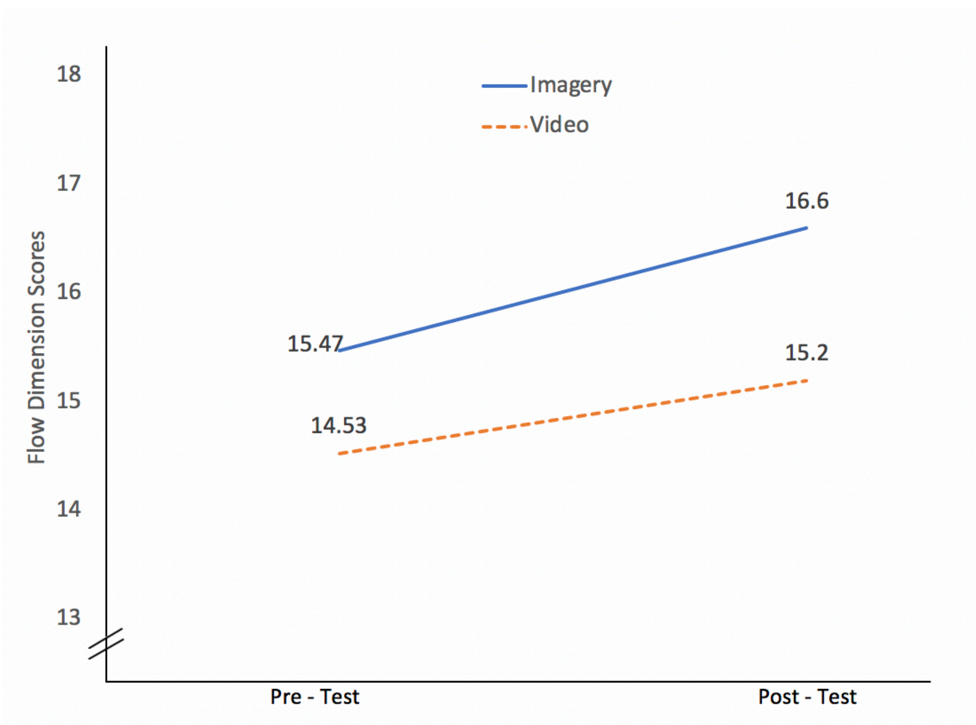

Figure 5.7. Mean Sense of Control for the Imagery and Video conditions at pre-test and post-test

Figure 5.7 shows the means for the sense of control flow state dimension for the Imagery and Video interventions and occasions. Participants in the Imagery conditions are shown again to be higher from the start and have a slightly steeper slope. Two-Way, Mixed-design ANOVA for the sense of control flow dimension revealed a significant main effect of conditions (p = .03), with a small effect size, indicating that participants in the Imagery condition had significantly higher flow on the sense of control dimension at pre-test and post-test than those in the Video condition. There was also a significant main effect of occasions (p = .003), with a small effect size, indicating that regardless of condition, participants increased their flow state scores on sense of control from pre-test to post-test. There was no significant interaction effect.

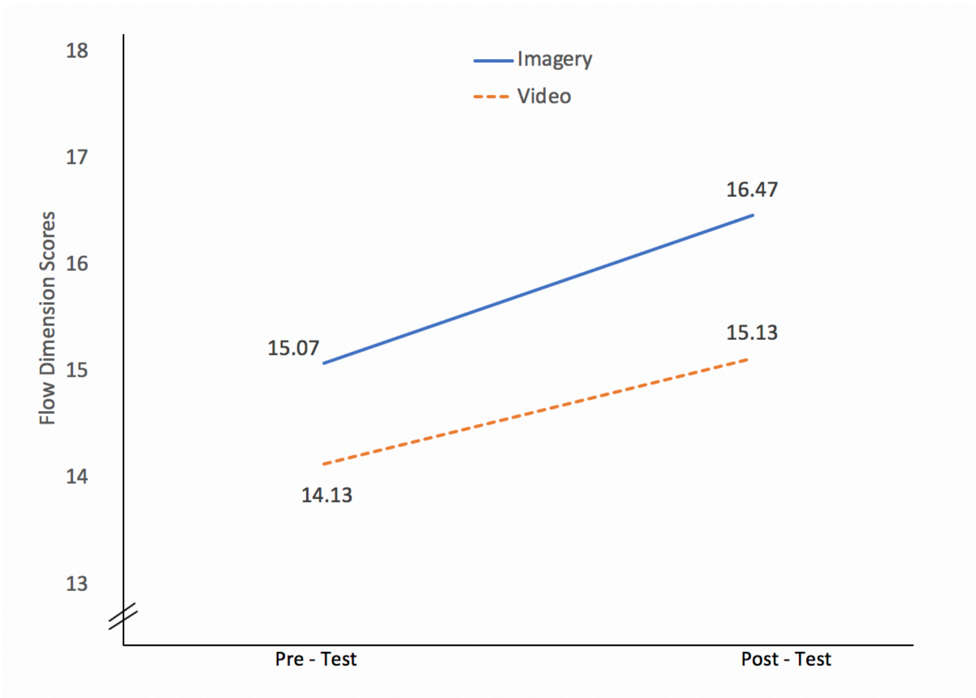

Figure 5.8. Mean Loss of Self-Consciousness for the Imagery and Video conditions at pre-test and post-test

Figure 5.8 shows the means for the loss of self-consciousness flow state dimension for the Imagery and Video intervention conditions and occasions. The Imagery condition was higher than the Video Placebo condition from pre-test and had a slightly steeper slope to post-test. Two-Way, Mixed-design ANOVA for the loss of self-consciousness flow dimension revealed a significant main effect of conditions (p = .03), with a small effect size, indicating that participants in the Imagery condition had significantly higher flow on the loss of self-consciousness dimension at pre-test and post-test than those in the Video condition. There was also a significant main effect of occasions (p <.001) with a medium effect size, indicating that regardless of condition, participants increased their flow scores on loss of self-consciousness from pre-test to post-test. There was no significant interaction effect.

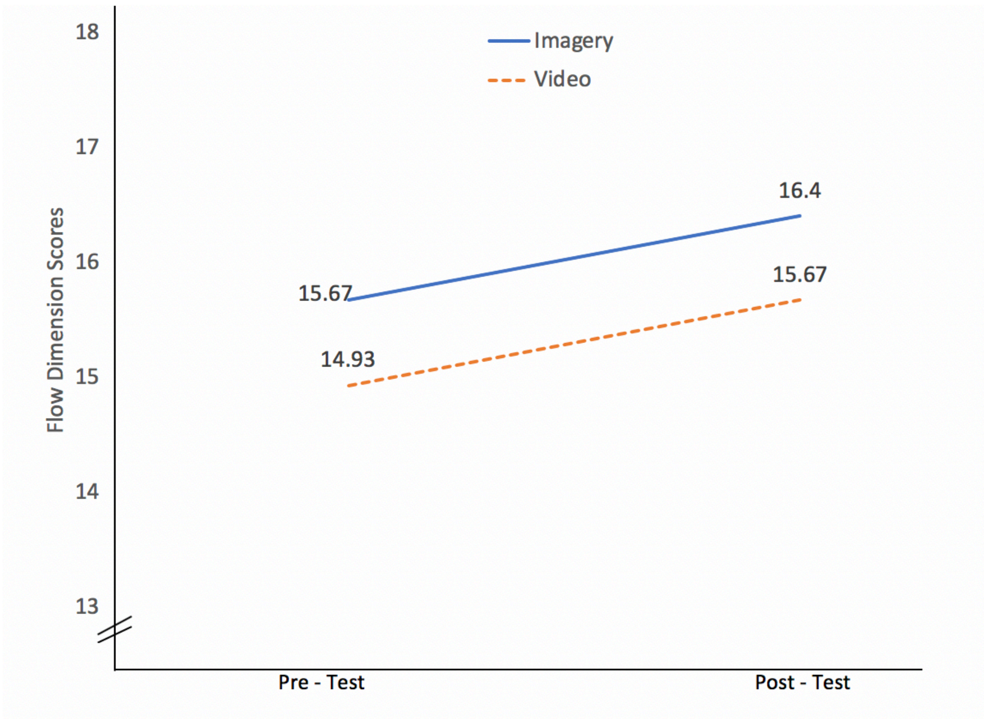

Figure 5.9. Mean Transformation of Time for the Imagery and Video conditions at pre-test and post-test

Figure 5.9 shows the means for the transformation of time flow state dimension for the Imagery and Video intervention conditions and occasions. The Imagery condition is, again, shown to be higher than the Video condition at pre-test and post-test and the two conditions are virtually parallel. Two-Way, Mixed-design ANOVA for the transformation of time flow state dimension revealed no significant main effect of conditions. There was a significant main effect of occasions (p = .02), with a small effect size, indicating that regardless of condition, participants increased their flow scores on time transformation from pre-test to post-test. There was no significant interaction effect.

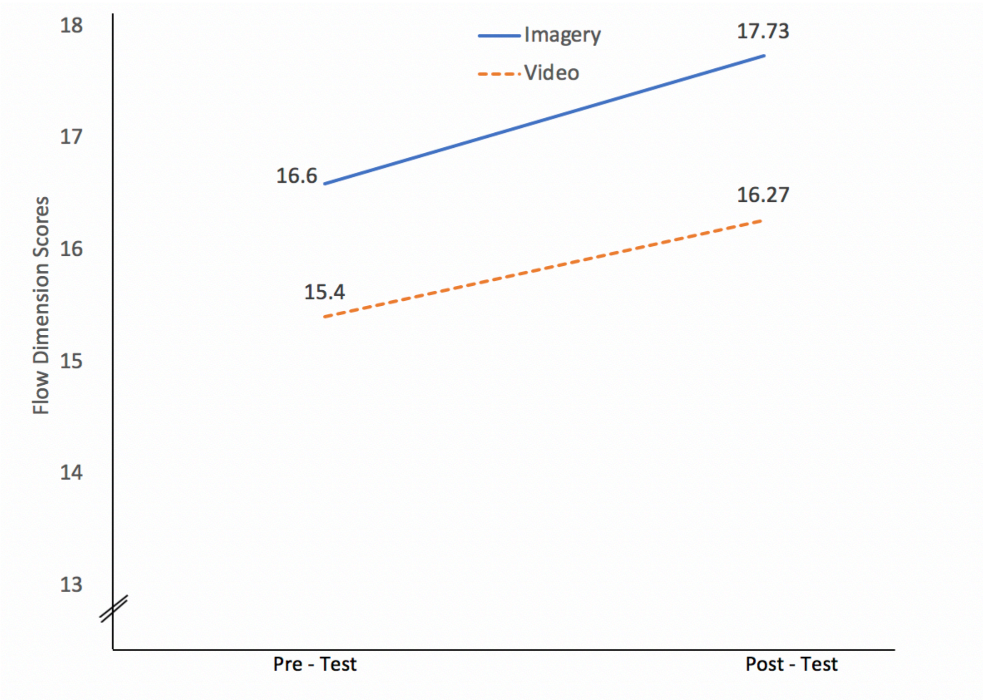

Figure 5.10. Mean Autotelic Experience for the Imagery and Video conditions at pre-test and post-test

Figure 5.10 shows the means for the autotelic experience flow state dimension for the Imagery and Video intervention conditions and occasions. The Imagery condition was shown to be much higher at pre-test and post-test than the Video condition and the slopes were very similar, suggesting there was no interaction effect. Two-Way, Mixed-design ANOVA for the autotelic experience flow state dimension revealed a significant main effect of conditions (p = .03), with a small effect size, indicating that participants in the Imagery condition had significantly higher flow state than the Video condition on the autotelic experience dimension at pre-test and post-test. There was also a significant main effect of occasions (p = .001), with a large medium size, indicating that regardless of condition, participants increased their flow scores on autotelic experience from pre-test to post-test. There was no significant interaction effect.

The means and SDs for the Imagery and Video intervention conditions for global flow state and all nine flow state dimensions are presented in Table 5.2. This table also includes the *F*, *p*, and η^2 values for the conditions main effect, the occasions main effect, and the interaction effect for each flow dimension.

Table 5.2.

Means and Standard Deviations, and ANOVA F, p, and η^2 Values for the Nine Flow Dimensions for the Imagery and Video Intervention Conditions at Pre-test and Post-test

Flow subscales	Condition	Pre - test		Post -Test		Condition			Occasion			Interaction		
		M	SD	M	SD	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
Global Flow State	Imagery Video	141.60 132.27	9.56 9.57	150.86 137.87	5.43 12.06	12.23	.002*	.30	31.65	<.001*	.53	1.92	.17	.06
Challenge Skill-Balance	Imagery Video	15.67 14.60	1.84 2.26	16.47 15.07	1.18 1.83	4.42	.04*	.13	4.10	.05*	.13	.28	.59	.01
Merging of Action and Awareness	Imagery Video	15.60 14.67	2.40 1.29	16.40 14.53	1.40 1.80	14.65	.001*	.34	.70	.41	.025	1.38	.25	.05
Clear Goals	Imagery Video	16.27 15.13	1.87 2.13	16.87 15.53	1.24 1.59	4.68	.04*	.14	3.12	.08	.10	.12	.72	.004
Unambiguous Feedback	Imagery Video	15.87 14.93	1.35 1.83	17.20 15.47	1.32 2.03	6.48	.01*	.19	9.25	.005*	.25	1.70	.20	.06
Concentration on the Task at Hand	Imagery Video	15.40 13.93	2.64 2.12	16.73 15.00	1.28 1.51	6.92	.01*	.20	10.06	.004*	.26	.12	.73	.004
Sense of Control	Imagery Video	15.47 14.53	1.96 1.72	16.60 15.20	1.18 1.42	5.11	.03*	.15	10.79	.003*	.28	.72	.40	.02
Loss of Self-consciousness	Imagery Video	15.07 14.13	1.53 2.03	16.47 15.13	.99 1.59	5.22	.03*	.16	16.43	<.001*	.37	.46	.50	.01
Transformation of Time	Imagery Video	15.67 14.93	1.29 2.40	16.40 15.67	1.18 1.87	1.64	.21	.05	6.28	.02*	.18	<.001*	1.00	<.001
Autotelic Experience	Imagery Video	16.60 15.40	1.40 2.26	17.73 16.27	1.38 1.79	5.28	.03*	.16	14.12	.001*	.33	.25	.62	.009

To summarize the results reflected in Figures 5.1 to 5.9 and Table 5.2, there was a significant conditions main effect for all flow state dimensions, except transformation of time. In all cases, participants in the Imagery condition showed higher levels of flow than those in the Video condition. There was a significant occasions main effect for all flow state dimensions, except merging of action and awareness and clear goals. In all cases flow state increased from pre-test to post-test. There were no significant interaction effects for global flow state or any of the flow state dimensions.

Basketball Shooting Performance

The results for basketball shooting performance are presented in Figures 5.10 to 5.12 and Table 5.3, which includes Two-Way, Mixed-design ANOVA results, comparing the Imagery and Video conditions at pre-test and post-test for 2-point, 3-point, and total basketball shooting.

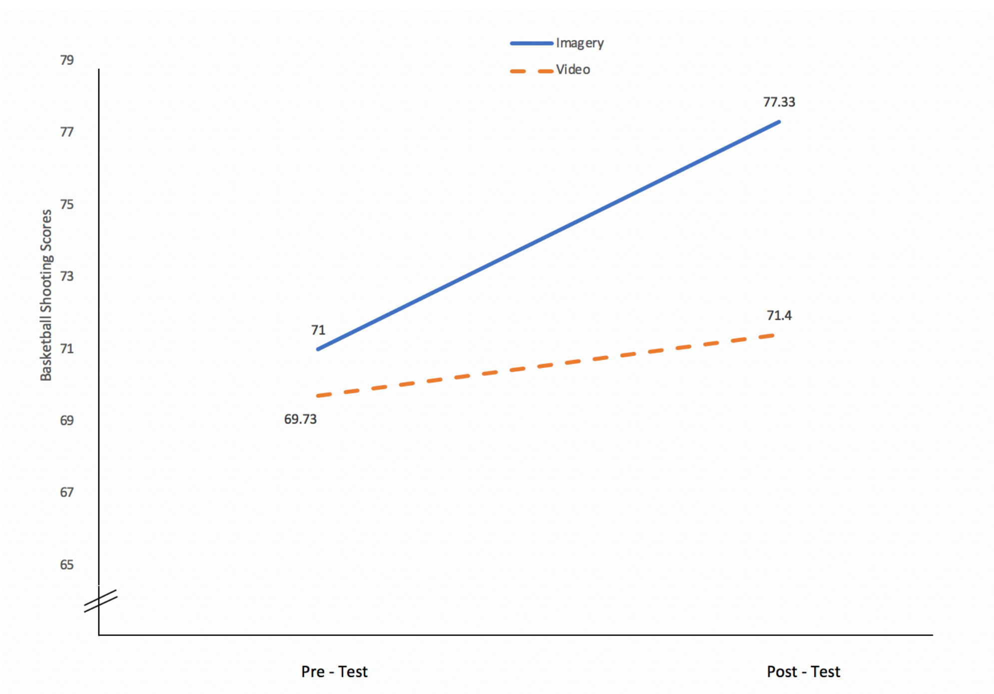

Figure 5.11. Mean 2-point shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 5.11 shows the means for 2-point shooting performance for the Imagery and Video intervention conditions at pre-test and post-test. The Figure shows an ordinal interaction with the Imagery condition increasing more steeply than the Video condition from pre-test to post-test. I conducted a Two-Way, Mixed-design ANOVA to compare the 2-point shooting means between conditions on the two different occasions. Analysis revealed no significant conditions main effect, a significant main effect of occasions (p <.001), with a large effect size, and a significant interaction effect (p = .007), with a large effect size. It appears that the main effect of occasions is largely due to the large increase from pre-test to post-test in 2-point shooting in the Imagery condition. This is supported by the significant interaction effect, which indicates that 2-point shooting increased significantly more from pre-test to post-test in the Imagery condition than it did in the Video condition.

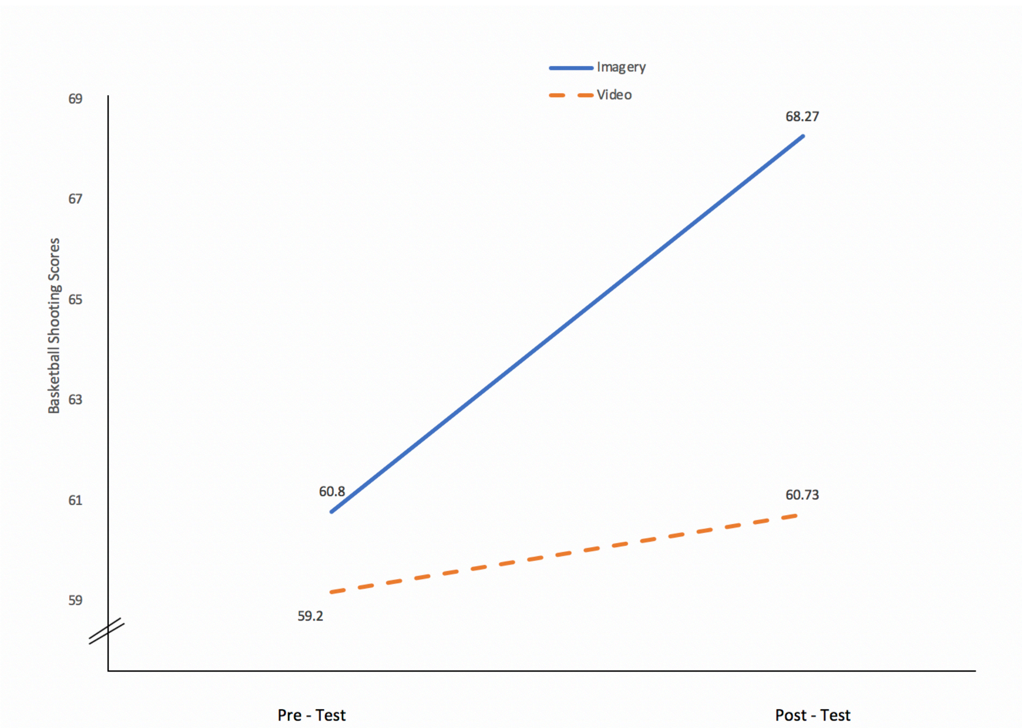

Figure 5.12. Mean 3-point shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 5.12 shows the means for 3-point shooting performance for the Imagery and Video intervention conditions at pre-test and post-test. For 3-point shooting, the mean for the Imagery condition, again, increased more steeply, but also from a higher level at pre-test, so this suggests a moderate ordinal interaction. Analysis, using Two-Way, Mixed-design ANOVA, revealed a significant conditions main effect (p = .01), with a moderate effect size, indicating that participants in the Imagery condition scored higher on 3-point shooting performance than those in the Video condition at pre-test and post-test. There was also a significant main effect for occasions (p <.001), with a very large effect size, indicating that participants scored higher on 3-point shooting at post-test than at pre-test, that is, they improved regardless of conditions. Finally, there was a significant interaction effect (p <.001), with a large effect size, indicating that participants in the Imagery condition improved their 3-point shooting performance significantly more than those in the Video condition. The substantial improvement in the Imagery condition from pre-test to post-test probably accounts for the main effect of occasions.

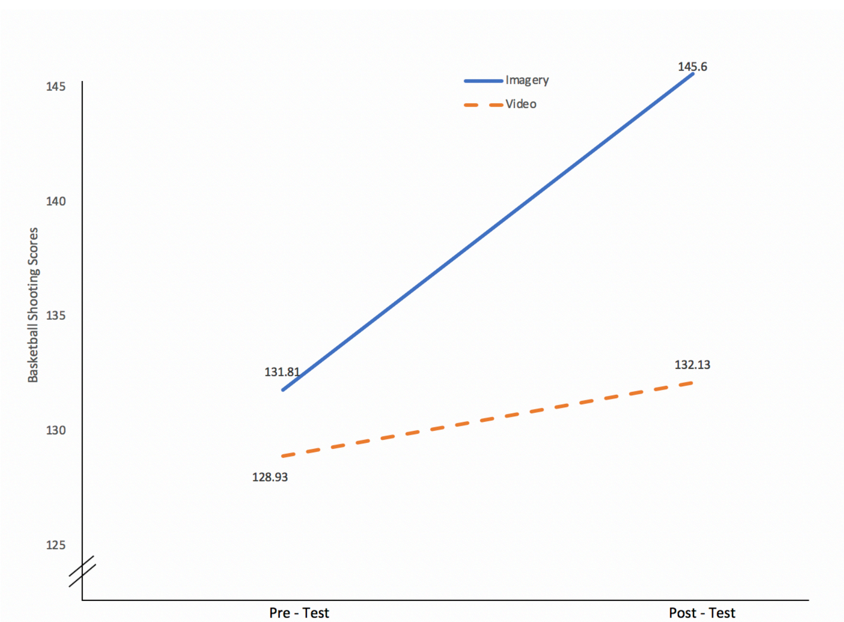

Figure 5.13. Mean total shooting performance for the Imagery and Video conditions at pre-test and post-test

Figure 5.13 shows the means for total shooting performance for the Imagery and Video intervention conditions at pre-test and post-test. The results are similar to those for 3-point basketball shooting performance. The Imagery intervention condition is higher at pre-test, but also has a steeper slope than the Video condition from pre-test to post-test, demonstrating an ordinal interaction. I compared the means of the total basketball shooting scores by adding together the 2-point and the 3-point shooting scores, which might have contributed to larger effects in this case. Analysis, using Two-Way, Mixed-design ANOVA, showed a significant main effect for conditions ($p = .02$), with a small effect size, indicating that participants in the Imagery condition scored higher than those in the Video condition at pre-test and post-test. There was also a significant main effect of occasions ($p <.001$), with a very large effect size, indicating that, regardless of condition, participants improved their total shooting performance from pre-test to post-test. Finally, there was a significant interaction effect ($p <.001$), with a large effect size, indicating that participants in the Imagery condition improved their total shooting performance significantly more than participants in the Video condition from pre-test to post-test. Again, the substantial improvement in the Imagery condition from pre-test to post-test probably accounts for the main effect of occasions.

The means and SDs for 2- and 3-point shooting performance, and total shooting performance for the Imagery intervention condition and the Video condition are presented in Table 5.3, along with the *F-values, p-values and* η^2 values for the conditions main effect, the main effect of occasions, and the interaction effect for each shooting performance comparison.

Table 5.3.

Means, and Standard Deviations, F, p, and η^2 *Values for Shooting Performance for Each Intervention Condition and Occasion (Pre-test and Post-test)*

Shooting	Condition	Pre-Test		Post-Test		Condition			Occasion			Interaction		
		M	SD	M	SD	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
2- Point	Imagery	71.00	7.40	77.33	7.49	2.43	.13	.08	25.33	<.001	.47	8.62	.007	.23
	Video	69.73	5.61	71.40	6.01									
3- Point	Imagery	60.80	6.46	68.27	4.13	6.35	.01	.18	48.39	<.001	.63	21.03	<.001	.43
	Video	59.20	4.61	60.73	5.56									
Total	Imagery	131.80	11.60	145.60	9.18	5.34	.02	.16	70.01	<.001	.71	27.22	<.001	.49
	Video	128.93	8.11	132.13	10.99									

Debriefing Interviews

The personal experiences that participants recounted in the interviews at the end of the study with all 15 participants in the Imagery intervention condition and all 15 participants in the Video condition provided some interesting outcomes. All participants reported that they had engaged in a sustained effort throughout the sessions and the athletes in the Imagery intervention especially felt that they had much improved their performance on the basketball-shooting test during Imagery training throughout the six sessions over two weeks. Some participants observed that the Imagery intervention also improved their actual shooting performance in competition games. The qualitative responses of the basketball players in the Imagery condition suggested that the sense of control Imagery intervention, focusing on calmness and confidence, used in this study was associated with enhanced relaxation, confidence level, and calmness. There are some effects of the intervention on sense of control flow experience. For example, basketball players explained their felling about flow; "I'm feeling really good and relaxed" and another one says, "I think I can do it". Some athletes indicated that during the intervention sessions, they had felt more relaxed and confident, calm, and motivated and that they wanted to train after experiencing each imagery session. For shooting performance, a number of participants from the Imagery condition expressed the feeling that they enjoyed having imagery sessions as a facilitator to utilise imagery in their performance. Furthermore, participants felt that the intervention had improved their performance. They made statements such as the following, "I felt more focused on my goals with the sessions", "I was focusing on the script and it just made me calm, relaxed and fully focused". Participants commented that they were very concentrated, relaxed, and they felt more confident, "I was very focused, but relaxed at the same time." One participant felt that the Imagery intervention might be useful, but it did not affect his shooting performance.

The Video condition in this study include 15 basketball players, who provided their experiences on flow and performance during the six study sessions in which they watched videos of basketball game play. Participants explained their experiences during the sessions, including their flow experience and experience of performance. Several of the athletes experienced enjoyment when they watched the Video of NBA competition game play, “I think it is like, I can play as the same as the video I had watched”. Furthermore, when they imagined the basketball game in their mind, they thought about making shots using the same action as they had seen NBA players use in the videos “I fell very enjoyed watching the basketball game”. They also reported experiencing imagery after they watched Video condition sessions, such as regarding their passing and dribbling the ball attempts to train more often or similar training likely to the NBA players in the videos. However, in this study, several basketball players did not enjoy watching the video of game play because it was perceived as boring and they found 15 minutes to be quite a long time to attend to the videos in each session. For example, “I think, the video really long and boring” “not fun”. They really wanted to play basketball in competition or to practice their shooting skills, and they felt that there are times when they do not need to be coached or receive any comments from anyone. Thus, insights from the interviews helped to explain how participants in the Video condition perceived this placebo intervention.

Discussion

In this study, I examined two propositions. The first proposition is that imagery of relaxation and confidence related to a sports task promotes the flow state dimension of sense of control. This is important because a high level of sense of control may be associated with enhanced global flow state, in a context where the challenge matches individuals’ skills for the task. The second proposition is that, when the imagery task promotes a sense of control, that association should increase and facilitate basketball-shooting performance in a context where the challenge matches the skills for the task. The results of this study were presented by examining the predictions related to the targeted flow dimension that it would increase significantly more from pre-test to post-test in the flow Imagery intervention condition than it would in the Video condition and the prediction that there would be a significantly greater increase in 2- and 3-point, and total shooting performance from pre-test to post-test in the flow Imagery intervention condition than in the Video condition. Results in this study indicated that flow state increased for global flow state and all nine flow state dimensions, following the Imagery intervention designed to increase sense of control. The Imagery condition produced significantly higher flow dimension means than the Video condition across pre-test and post-test. There was a significant main effect of conditions for all flow dimensions, except transformation of time. There was also a significant main effect of occasions for seven flow state dimensions. Regardless of their intervention condition, participants in this study showed significant increases from pre-test to post-test for seven of the nine flow dimensions, the exceptions being merging of action and awareness and clear goals. For the other seven flow state dimensions, the Video condition participants slopes were lower at pre-test and similar amount at post-test. The finding of significantly higher means at pre-test for seven flow state dimensions in the Imagery condition, compared to the Video condition, is surprising given that participants were matched in pairs at pre-test based on demographic variable scores and then one member of each pair was assigned at random to either the Imagery condition or the Video condition. Further, although differences on basketball experience and basketball shooting practice during the intervention period were not significantly different between the two research conditions, it was the Video condition that showed noticeably longer experience and more shooting practice, which should not be related to lower pre-test flow dimension scoring. Nonetheless, the Imagery condition did show higher flow dimension scores at pre-test and it is possible that this might have limited the extent to which those flow dimensions could increase at post-test due to a ceiling effect, leading to there being no significant conditions x occasions interaction effect. This is one possible explanation for the pattern of flow increase being equivalent in the Imagery condition and the Video condition from pre-test to post-test, when there was evidence of significantly greater increase in the Imagery condition than in the Video condition on key flow state dimensions in Studies 1 and 2. Thus, the results in the present study are inconclusive, showing that both the Imagery condition and the Video condition were associated with equivalent increases in flow experience during the study. Thus, these increases cannot be unequivocally attributed to the influence of the Imagery intervention.

There was also a significant main effect of conditions for 3-point, and total shooting performance. In this case, although the Imagery condition shooting means were somewhat higher than the Video condition means at pre-test, it seems that the large increase in the performance means at post-test in the Imagery condition compared to the Video condition was the main contributor to the conditions main effect. In addition, all three basketball-shooting performance variables showed main effects of occasions. Again, the large increase in the Imagery condition mean performance from pre-test to post-test appears to have played a role here. This is supported by the findings that there were also significant interaction effects for all three shooting performance measures. Given that there were no significant interaction effects for flow state dimensions, the larger increases in performance measures in the Imagery condition than the Video condition from pre-test to post-test could be due to an independent effect of imagery on performance. It is possible that this was related to the content of the Imagery intervention, which focused on increasing confidence by imagery of successful shooting. There are many examples of interventions that have improved performance with similar confidence-building imagery content based on participants imagining successful outcomes of performance (e.g., Koehn et al., 2013; Munroe-Chandler & Hall, 2004; Nordin & Cumming, 2005).

Confidence is one of the most crucial psychological variables that affect performance and flow experience, according to Jackson (1992; 1995), Kimiecik and Stein (1992), and Stavrou and Zervas (2004). Koehn et al. (2013) showed that confidence is an important factor in helping athletes to achieve flow. Jackson and Marsh (1996) also suggested that a sense of control can be important, or even essential, to the flow experience. Individuals who have less concern about other people's judgements and have high self-confidence can perceive a challenge in a more positive way (Bandura, 1986). It is possible that confidence can assist athletes in approaching the task with less concern, that is, cognitive state anxiety, and more concentration than individuals with lower confidence. At the same time, confident athletes may be more likely to perceive a balance between their skill and the challenge they face, which is a crucial factor in bringing about flow. Athletes with less self-confidence may be more concerned with their outlook and performance and, as a consequence, become more anxious and unable to attain flow (Jackson & Roberts, 1992). Koehn et al. (2013) also found a positive link between confidence and flow state. Confidence was particularly important in helping to improve flow from 5% to 32%, when combined with the three source domains of achievement, self-regulation, and social climate.

With reference to flow state dimensions, researchers showed participants in the Imagery condition scored considerably higher on all flow state dimensions than Video condition participants at pre-test. This pattern was sustained or marginally increased by post-test for all flow state dimensions. Two-Way, Mixed-design ANOVAs indicated that there were significant main effects of condition, so participants in the Imagery condition scored significantly higher on all flow dimensions than Video condition participants. The flow state dimensions of C-S balance, unambiguous feedback, total concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, and autotelic experience all showed significant main effects of occasion. Certainly, sense of control improved substantially for participants in the Imagery condition, which focused on the experience of calmness and relaxation, as well as the perception of confidence in the context of performing 2- and 3-point basketball shooting. However, this improvement was not significantly larger than the improvement made by Video condition participants. In addition, the change in flow state was not limited to sense of control, as increases of a similar level were observed for six other flow state dimensions. The results clearly demonstrate significant effects on shooting performance for occasions and the conditions x occasions interaction for the 2-point task, and conditions, occasions, and the conditions x occasions interaction for both the 3-point task and total shooting scores of the basketball players in the Imagery condition.

Koehn et al. (2013) researched effects of confidence and anxiety on flow state in competition. In one of his landmark publications, Csikszentmihalyi (1975) acknowledged that whilst the state of flow is rare, achieving it results in highly positive experiences in everyday life, as well as sport. What boosts these positive effects is athletes having confidence, whereas it has been found that anxiety can lead to negative associations with flow (Jackson et al., 1998).

In the present study, I did not find a significant interaction effect for global flow state. There were no significant interaction effects for the nine flow dimensions. Considerable focus has recently fallen on the concept of flow in relation to sport, both in terms of understanding how the ephemeral process of flow is generated and in terms of examining its link to performance by global flow (Jackson & Csikszentmihalyi, 1999). The key antecedents of flow have been proposed in a small number of studies, but no systematic examination has been undertaken to test whether enhancing these proposed antecedents facilitates the experience of flow in sports tasks (Waraphongthanachot et al., 2017). No systematic research has been published on the application of imagery to increase specific dimensions of flow (Waraphongthanachot et al., 2017). Thus, this study was original, in that I aimed to enhance knowledge about the mechanisms underlying flow in sport by systematically examining the effect on the experience of both global flow state and the nine individual dimensions of flow state of using an imagery intervention to enhance the sense of control antecedent of flow. Results were inconclusive for global flow and the flow dimensions because, although participants reported increases in their experience of flow following the Imagery intervention, these could not unequivocally be attributed to the intervention. At the same time, I observed clear and strong effects of the imagery intervention on all three measures of basketball-shooting performance, providing further support for the efficacy of imagery training for enhancing sports performance.

Methodological Issues and Limitations

The present study had a number of methodological issues and limitations. The issue that may have most strongly restricted attainment of the aims of the study was the pre-test differences observed in flow state dimensions between the Imagery condition and the Video placebo condition. The SIAM was used to screen for at least moderate imagery ability being tested before basketball players participated in the Imagery and Video conditions. I also checked basketball competition experience between the conditions. I matched participants into pairs based on the demographics, including the team they played for and the division they played in and assigned one member of each pair to each research condition. After the study, I checked time spent undertaking basketball shooting practice during the intervention period. I tested imagery ability, basketball experience, and basketball shooting practice between the Imagery condition and the Video Placebo condition and found no significant difference for any of these variables. Despite the matching and the absence of any systematic differences on the demographic variables, in all flow dimensions, participants in the Imagery condition showed significantly higher pre-test levels of global flow state and flow state dimensions than those in the Video condition. In both research conditions, flow state increased from pre-test to post-test. There were no significant interaction effects for any flow state dimensions. The results reflected in Figures 5.1 to 5.9 and Table 5.2, indicate that there was a significant conditions main effect for global flow state and all flow state dimensions, except transformation of time. It is possible that the higher levels of flow variables at pre-test limited the extent to which flow could increase from pre-test to post-test in the Imagery condition, resulting in the observed equivalent level of increase for the Imagery condition and the Video condition for the flow variables that was not consistent with results for flow in Study 1 and Study 2. To minimise the possibility of this outcome, I recommend that, in future, researchers should match participants into conditions on the basis of their pre-test flow state dimensions and global flow state scores.

The suggestion that the sample was too small cannot be said for the performance results, which were strong and clear. The Imagery condition produced significantly larger increases in 2-point and 3-point shooting and as a consequence, in total shooting. The anomaly found for the flow variables that there was a significant difference between the research conditions at pre-test appears to be a real difference. The presence of significant main effects for all flow variables, except merging of action and awareness and clear goals, provides further evidence suggesting that the sample was adequate to identify real significant effects. It is also possible that there were not sufficient sessions. It is likely that more sessions per week or more weeks of the interventions would have had an impact on the results, that is, significance levels could have been increased, but I doubt that more sessions would have changed the pattern of results. In particular, I expect that the main effects of conditions would still occur because they are based on pre-test differences that would not be affected by additional intervention sessions at the end of the study.

It is clear that imagery of successful performance, as presented in the imagery script in the present study in the form of imagining experiencing sense of control, by managing relaxation and confidence, to enhance performance was an effective imagery technique to enhance basketball-shooting performance in field study conditions. However, in the present research design, it is not clear whether sense of control played a mediating role in the effect of imagery on performance or whether imagery of successful shooting influenced shooting performance directly. More sophisticated research with larger samples and using modelling analysis would be necessary to examine this issue further, and that was beyond the time and resources of this PhD project. Further, this study and the two studies that preceded it, have produced evidence in the low to moderate stress environment of field studies. This limitation could be addressed by conducting similar intervention studies in the real competition environment of basketball league shooting, as exemplified by Fazel (2015) in a single-case design study of the effect of an imagery intervention on free-throw shooting in the same league. Thus, the present study provides sport psychologists with more evidence supporting this kind of imagery intervention in their work in enhancing performance in sport.

Further Research

In the present study, the aim was to examine the role of imagery as an intervention to influence the specific flow antecedent of sense of control. The imagery script was based on the two major components of sense of control, namely calmness and confidence. The study also examined the impact of this intervention on basketball-shooting performance. The effect of the imagery script was compared with a placebo control condition. Although global flow state and most flow state dimensions increased from pre-test to post-test in the Imagery condition, equivalent increases in the Video condition make the conclusions of the present study equivocal. There is no evidence to support an active intervention effect in the Video condition. This placebo condition was the same as the one applied in Study 2 with apparently similar participants. In Study 2, there was no evidence of increases in most flow state dimensions from pre-test to post-test for the Video Placebo condition. Thus, the increase in flow state dimensions from pre-test to post-test in the present study is difficult to account for. The combination of the pre-test difference between the Imagery and the Video Placebo condition and the significant increase in flow variables from pre-test to post-test in the Video Placebo condition must be viewed as anomalies. As noted in the Methodological Issues section, the pre-test difference should be minimized by pre-intervention matching of participants into the research conditions on the basis of pre-test flow variable scores. To minimize any effect of aspects of Video Placebo conditions or extraneous variables affecting participants in those conditions, care should be taken to control any possible influences. Suggestions for further research in this section are based on these principles and practices.

Because the results of the present study are equivocal, the first suggestion for further research is to replicate the current study on the impact of an imagery intervention focused on sense of control in basketball shooting, with the same design, including a video placebo comparison condition, but to implement the matching of participants to imagery and video placebo conditions on the basis of pre-test global flow state and flow state dimensions scores. Studies could also be conducted with basketball free-throw shooting and in similar target tasks, including netball shooting, pistol shooting, archery, golf, putting, and ten-pin bowling. This should determine whether imagery of sense of control does increase the sense of control flow state dimension, global flow state, and other flow state dimensions.

Should such studies support the proposal that imagery interventions designed to promote the antecedent flow state dimension of sense of control do lead to increases in sense of control, global flow state, and other flow state dimensions, as did the other antecedent flow state dimensions in Study 1 and Study 2, research could then focus on examining more closely the key aspects of such imagery interventions. Sense of control is usually described as a combination of feeling calm and confident (Jackson & Csikszentmihalyi, 1999). In the present study, the imagery intervention was designed to enhance calmness and confidence. However, it might be that the key psychological variable is calmness or a relaxed state and confidence plays only a minor role. Conversely, it is possible that confidence is the key factor and calmness arises as a consequence of a feeling of confidence. Alternatively, it might be that both calmness and confidence need to be emphasized in imagery interventions, as they were in the present study. To test this, studies could be conducted to compare the impact on flow variables of an imagery intervention that focuses on relaxation and calmness, with little or no focus on confidence, an imagery intervention that focuses on enhancing confidence, with no content to actively promote calmness, and an imagery intervention that promotes confidence and calmness equally.

To further explore whether the impact of any of these interventions might enhance one aspect of sense of control first and that might lead to increases in the other aspect, studies could be conducted that apply longer imagery intervention periods and multiple testing with FSS-2. For example, 6- or 8-week long interventions with two imagery sessions per week could be conducted. Flow experience could be measured at the end of each week to monitor changes over the intervention period. In order to examine independently whether calmness or confidence changes early or late in the imagery intervention period, separate measures of confidence and anxiety (to measure calmness) could be monitored, using a measure like the Revised Competitive State Anxiety Inventory-2 (CSAI-2R; Cox, Martens, & Russell, 2003), which measures cognitive state anxiety, somatic state anxiety, and state self-confidence in sport. This measure would be administered at the end of each week at the same time as the FSS-2 and patterns of cognitive state anxiety, somatic state anxiety, and state self-confidence would be examined to identify trends of change from week to week.

The studies described in the previous paragraph would also permit examination of the timing of changes in the flow state dimensions over the imagery intervention period, as proposed in the Further Research section of Study 2. This would give an indication of any sequence of increases in flow state dimensions to determine whether sense of control increases earlier than other dimensions, when the imagery intervention focuses on sense of control, or whether all the flow dimensions that are affected by the intervention changed at the same time. This could suggest that, through mechanisms not intentionally manipulated, the imagery intervention independently affected various flow state dimensions. Alternatively, it is possible that it would highlight a problem of phenomenology, that is, it is possible that individuals cannot phenomenally distinguish between the experience of different flow dimensions, so when one dimension is influenced by an intervention, such as imagery, individuals report increases in all or most flow dimensions. As discussed in the Study 2 Further Research section, this might suggest the need for more sophisticated research with large samples and the application of modelling techniques.

With reference to performance, the results of the present study were clearly supportive of the efficacy of imagery as a technique to enhance basketball-shooting performance. This is consistent with a large amount of previous research in sport (Fazel et al., 2018; Guillot et al., 2009; Hardy & Blom 2002; Shalaby, 2010). Importantly, the large increase in basketball-shooting performance observed in the Imagery intervention, in comparison to the Video condition, was achieved with an imagery script that did not focus on performance, but focused on the experience of sense of control during the process and outcome of basketball shooting. This raises the question of whether sense of control played a mediating role in the improvement in basketball shooting performance or whether imagery had a direct effect on basketball-shooting performance. One finding that suggests some reservations about the mediating role of sense of control in the present study is that sense of control in the Video condition increased by approximately the same amount as it did in the Imagery condition, but there were strong interaction effects of 2-point, 3-point, and total shooting, indicating a substantially larger increase in performance for the Imagery condition than the Video condition. This is not consistent with sense of control playing a mediating role. Nonetheless, research to examine whether sense of control plays a mediating role in the effect of imagery on basketball-shooting performance would be valuable to clarify this issue. As discussed in the Further Research section of Chapter 4, examining the mediating role of flow variables in the relationship between imagery and performance might best be achieved using large sample research with intervention designs similar in construction to the present study, which then permit modelling analysis to test models in which imagery influences flow and flow influences performance against models in which imagery influences flow and performance independently. In terms of illuminating the causal relationships between imagery of calmness and confidence, the flow state dimension of sense of control, and performance in basketball shooting, imagery interventions similar to the one applied in the present study would be appropriate and outcomes could be measured using the FSS-2 and a basketball-shooting performance test similar to the test employed in this study. Structural equation modelling (SEM) would be conducted to test the competing models. Parallel studies could be conducted in basketball free-throw shooting and in other target sport tasks.

Conclusion

The significance of this study is that, in it, I sought to examine the use of imagery to enhance the sense of control flow dimension, which is one of the five flow state dimensions that Stavrou and Zervas (2004) proposed are antecedents of flow. In this study, I examined whether this lead to increases in the experience of flow in the context of basketball shooting. These findings are difficult to reconcile with the intended effects of the interventions. Regarding antecedents and concomitants, I based the flow Imagery intervention on enhancing the attributes of sense of control, namely calmness, relaxation, and confidence. I expected that the flow Imagery intervention would promote the sense of control flow state dimension because I designed the intervention to focus on it, rather than the other four antecedents or any of the concomitants. I found that the flow Imagery intervention was associated with an increase in the targeted dimension, but also six of the other eight flow dimensions increased significantly. The Video intervention was intended to be a placebo, but the same flow state dimensions increased by an equivalent amount in the Video condition as in the Imagery condition, just from a lower pre-test level in each case. The pattern found in the present study is not consistent with the conceptualisation of antecedents and concomitants, suggesting that further exploration is needed to understand the nature of flow dimensions as antecedents and concomitants of flow.

The performance of 2-point, 3-point, and total shooting increased significantly more in the flow Imagery condition than the Video condition. This was especially the case for 3-point and total shooting. Two-Way, Mixed-design ANOVA showed significant interaction effects for all three basketball shooting performance measures. This indicates that the Imagery condition had a significantly greater effect on performance than the Video condition. In the Imagery intervention, it is possible that elements of the intervention related to imagining performing shooting well and achieving success with shots enhanced performance. It seems more likely that the effect of imagery on performance was a direct effect, not mediated by flow.

CHAPTER 6

GENERAL DISCUSSION

Introduction

This thesis comprises three studies investigating the effects of imagery interventions on flow antecedent dimensions and basketball-shooting performance. A primary aspect of this research was to examine the impact on the experience of flow and performance of imagery interventions designed to increase proposed antecedents of flow (Stavrou & Zervas, 2004), illuminating mechanisms underlying the positive experience of flow in sport. The proposed antecedent dimensions of flow are challenge-skills balance, clear goals, unambiguous feedback, total concentration, and sense of control. In this General Discussion chapter, first, I summarise the conclusions from the three studies. Then, I discuss methodological issues of a general nature that emerged from the present research. Next, I provide directions for further research that are based on the outcomes from all three studies in the thesis, that is, they consider the bigger picture of understanding and promoting the experience of flow in sport. Then, I examine implications for practice based on understanding of the impact of imagery on flow and performance gleaned from the three studies. Finally, I present concluding remarks about the research reported in this thesis.

Conclusions

The overall goal of this research was to compare the impact of imagery scripts comprising different content designed to focus on the designated flow antecedent dimension(s) in each study. The antecedent dimensions of flow targeted in each study were C-S balance, clear goals, and unambiguous feedback in Study 1, total concentration on the task in Study 2, and sense of control in Study 3. In each study, I compared the active imagery intervention with a placebo condition in which participants watched video of elite-level basketball competition for the same duration and at the same frequency as the imagery sessions, but, with no instructions. I assumed that participants in this condition would simply enjoy watching the best players in the world playing the game these participants enjoy. The results of all three studies supported the effect of flow imagery interventions on flow experience and shooting performance to different extents. Participants were able to increase some or all flow state dimensions, as well as basketball shooting performance, using imagery scripts as the intervention in each study. I screened potential participants, using the SIAM to select moderate to high ability imagers. All participants reported moderate to high scores on almost all subscales of the SIAM, scoring particularly high on potentially important imagery ability characteristics, including vividness, control, and the visual and kinaesthetic senses. All participants demonstrated strong imagery abilities to perform imagery training, so they were all invited to participate in the study for which they had been recruited. The SIAM provides a check that reduces the chance that research results in unwarranted conclusions because differences in outcomes of imagery use could be related to differences in imagery ability between participants in research conditions that are under comparison. It is possible that participants with low imagery ability might show little or no improvement from an imagery intervention because they do not have sufficient capacity to use the imagery in the intervention. However, this could give the appearance that the imagery script was not effective (Watt et al., 2004; Watt et al., 2018). For this reason, individuals with low imagery ability are excluded from studies testing the efficacy of imagery interventions. Morris et al. (2005) stated that the two imagery ability dimensions most often discussed are vividness and controllability. Both characteristics provide useful information about the probable effectiveness of imagery because vividness relates to participants' self-report of clarity and reality in the image and controllability reflects individuals' ability to influence or manipulate the content of the image. Researchers have found pre-testing on imagery ability, as the basis for selection of participants suitable for research on interventions based on imagery, to be an effective element of the design of such studies. For example, in a study of the use of imagery interventions to enhance flow state, Koehn et al. (2014) measured imagery ability of youth tennis players, using the SIAM. They examined the effect of imagery on flow and tennis performance based on participants producing at least moderate scores on the 12 sub-scales of the SIAM. Koehn et al. found that the participants reported increases in global flow state based on the imagery intervention and this was associated with significant improvements in tennis performance.

In each study in the present thesis, the aim was to enhance knowledge about the mechanisms underlying the occurrence of flow state in sport by systematically examining the experience of using a targeted imagery intervention to enhance specific psychological antecedents of flow state. Thus, the three studies in this thesis were developed on the basis of the proposition by Stavrou and Zervas (2004) that five of the nine flow state dimensions proposed by Csikszentmihalyi (1975) are antecedents, whereas the other four flow dimensions are concomitants. Stavrou and Zervas proposed that flow antecedents are dimensions the presence of which enhances the likelihood of individuals experiencing flow. They claimed that concomitants, on the other hand, are dimensions (action-awareness merging, loss of self-consciousness, time transformation, autotelic experience) that individuals experience when they have already attained a flow state. Thus, according to Stavrou and Zervas, antecedents can be used to promote flow, whereas concomitants cannot. Research examining this proposition is limited. Thus, I devised three studies to examine whether the antecedent flow dimensions could be enhanced by imagery of desirable conditions and how this would affect basketball-shooting performance.

In each study, participants undertook six sessions of imagery of basketball shooting designed to promote key antecedents of flow. I conducted all imagery sessions with the participants and asked them to complete an intervention logbook to check adherence. I found that adherence was 86.66 percent in Study 1, 96.66 percent in Study 2, and 93.33 percent in Study 3 respectively. In addition to providing a check that participants performed the imagery interventions as intended, it is possible that use of the adherence logbook increased participants' motivation to undertake the imagery training. Post et al. (2012) found that using a logbook to report adherence to a daily intervention requiring a behavioural action in older adults was an accurate and simple approach to use in clinical trials, as evidenced by high levels of the target behaviour recorded by an electronic monitor.

In Study 1, focusing on clear goals, along with C-S balance and unambiguous feedback, I found that flow state increased for global flow state and all nine dimensions, following the flow Imagery intervention. Global flow state and the nine dimensions of flow increased from pre-test to post-test. In particular, the three targeted dimensions showed significant interaction effects indicating that flow increased significantly more from pre-test to post-test in the Imagery condition than in the Video Placebo condition. It should be noted that in Study 1, flow dimensions and 2-point shooting performance also increased in the Video placebo condition, which was enhanced significantly across occasions. The Video intervention was intended to be an attention placebo condition. A placebo condition fills the same amount of time as the imagery intervention, appears to the participants who experience it to be relevant to the task, but has no effect on the outcomes of interest, in this case global flow state, specific flow state dimensions, and performance. The findings of increased flow state and performance in the Video placebo condition are difficult to reconcile with the intended effects of the interventions. The Video intervention showed the world's best basketball players successfully shooting basketballs. By watching this, even without any instruction related to learning or improving performance, participants in this condition might have been motivated to perform shooting at a higher level, that is, they might have made greater effort. It is also possible that participants gained confidence that helped them shoot more accurately. At post-test, participants also achieved a heightened sense of flow, becoming immersed in the outstanding shooting they observed. Participants in the Video condition might also have learned aspects of technique that improved their performance and increased flow state by paying attention to the body and arm movements made by the highly-skilled models in the video. That is, they might have experienced an incidental observational learning effect. There is substantial evidence that video modelling is an effective skill enhancement technique in its own right, and it is possible that this could have occurred incidentally. That is, even when I did not give any instructions for participants to observe the video with the intent to learn, participants might still have gleaned useful technical information by watching highly skilful shooters. According to Sidaway and Hand (1993), video modelling is visual information that can be delivered using videotape, showing the performance that is essential and potentially influencing observers' performance in the future. Bandura (1986, 1997) described modelling through social cognitive theory, as a psychological matching method, where observers attempt to imitate and match their behaviour with the model's actions, using the cognitive representation from the information gained during visual and verbal demonstration. Bandura also found that behaviour is mediated by exposure to the model. He reported that several exposures to the model enhanced the quality of mental representation and improved performance. The effects of modelling on sport performance might be detected from changes in psychological responses among athletes (Bandura, 1986). More recent research has extended the support and understanding of observational learning in relation to motor imagery (Eaves, Riach, Holmes, & Wright, 2016; Holmes, & Calmels, 2008; Holmes, Cumming, & Edwards, 2010). The conclusion from this finding in Study 1 is that placebo conditions should not involve the performance task being studied, but must appear interesting and meaningful to participants.

In Study 1, basketball shooting performance improved as a result of the participants adhering well to the imagery script that focused on C-S balance, clear goals, and unambiguous feedback. Results for 2-point, 3-point, and total basketball shooting scores showed significant increases in the Imagery intervention, related to strong main effects of occasions, which meant that the Video Placebo condition also showed improvements in performance, although not as large as the Imagery condition improvements. This was especially the case for 3-point shooting in this study. It is possible that elements of the intervention that related to imagining performing basketball shooting well contributed to enhanced performance. Mental imagery enriches the cognitive information associated with skills, such as movement timing, sequencing, and planning (Guillot et al., 2009). For example, basketball players can use imagery to rehearse a shooting technique. This will help these athletes to control their technique or correct mistakes and to perform basketball shooting successfully in competitions, where there is not enough time for thinking and responses must be automatic. In addition, clear goals provide athletes with knowledge that will guide them to perform well, because when athletes have clear goals, they are sure what they need to do to achieve the goal, so they can focus on the task and make maximal effort to achieve the goal. Together with C-S balance, clear goals are considered to be the foundation for flow (Jackson, 1995). Because of their strong awareness related to the goal of the task they are performing, athletes have a sense of direction. To summarise, in Study 1, participants in the Imagery intervention condition showed promising increases in global flow state and flow state dimensions, as well as in performance of basketball shooting. Comparisons with the Video condition were not as clear as expected because several aspects of flow and performance also showed positive changes in the Video Placebo condition. These appear most likely to be related to incidental motivational and learning effects associated with watching highly-skilled players performing basketball shooting in competition.

In Study 2, the focus was on the key flow state dimension of total concentration on the task. Total concentration is closely related to the essence of the flow state, which is defined in terms of total immersion or absorption in the task to the extent that all other external and internal sources of stimulation are not attended to. The aim of Study 2 was to investigate whether an Imagery intervention based on relaxation to facilitate the generation of vivid, controllable images and focusing on concentration on the task at hand would produce increases in flow state dimensions, especially total concentration, as well as basketball shooting performance, compared to a Video placebo condition. The results of Study 1 for the intended Video placebo condition showed positive effects for flow and performance, suggesting that watching the world's best basketball shooters performing successful shots appeared to have incidental motivational and performance effects. To address this unexpected outcome, in Study 2, I changed the Video placebo condition to focus on video of NBA competition play, but excluding shooting. Examination of the means for flow state dimensions indicated that all nine flow dimensions in the Imagery condition increased more than they did in Study 1 from pre-test to post-test. In addition, the analysis showed that there were significant interaction effects for global flow state and all nine flow dimensions, all indicating that flow increased more in the Imagery intervention condition than in the Video placebo condition from pre-test to post-test. Csikszentmihalyi (1975) stated that flow is an experience in which an individual is completely immersed in an activity without reflective self-consciousness, but with a deep sense of control. Furthermore, Stavrou et al. (2015), referring to Csikszentmihalyi, proposed that flow experience indicates an optimal and pleasurable experience, linked to intrinsically-rewarding and highly-enjoyable feelings (Csikszentmihalyi & Csikszentmihalyi, 1988; Jackson & Csikszentmihalyi, 1999). When athletes focus their concentration totally on the task, they experience an absence of worry about the upcoming result, and their automatic and effortless experience increase the probability that athletes will experience flow (Csikszentmihalyi, 1988; Jackson, 1995; Jackson & Csikszentmihalyi, 1999). Understanding flow theory, Kimiecik and Stein (1992) proposed that being task-involved must facilitate athletes to focus more on the task at hand, indexing the ability to get absorbed in an activity. Consequently, this might lead to the characteristics of flow experience like enjoyment of the activity, higher levels of concentration, and feeling in control. These descriptions of possible links between different flow state dimensions suggest ways in which the Imagery intervention condition in Study 2, while focused on enhancing total concentration on the task, might have enhanced other flow dimensions as a consequence of increasing total concentration.

For basketball shooting performance, the results of Study 2 indicated that performance increased substantially from pre-test to post-test for 2-point and total shooting in the Imagery condition, but results showed little change for 3-point shooting. The main effect of occasions was significant for 2-point and total shooting. The conditions x occasions interaction effect was also significant for 2-point and total shooting, indicating that performance in the Imagery condition increased significantly more than in the Video condition. A factor that has been examined in a number of studies on imagery is the type of task to which imagery is applied. In their seminal meta-analysis, Feltz and Landers (1983) claimed the evidence at that time suggested that imagery is more effective in cognitive tasks, or tasks with large cognitive components, than it is in motor tasks. Although researchers have since shown effects of imagery on predominantly motor tasks (e.g., Bohan, Pharmer, & Stokes, 1999), the consensus remains that imagery is particularly effective for cognitive tasks (Schack, Essig, Frank, & Koester, 2014).

Whereas 3-point shooting showed the largest improvement in Study 1, 3-point shooting results showed little change from pre-test to post-test for either condition in Study 2. Participants in this study might have had more limited skill level in basketball shooting. They mostly appeared to play in the centre position, which in basketball plays near the baseline, close to the basket. Thus, their experience would largely have been of taking 2-point shots near the ring. Basketball players who usually occupy the centre positions have limited opportunity to shoot 3-point shots. This means that, compared with the participants in Study 1, the participants in study 2 might have been less skilled at performing 3-point shots, so they did not benefit from the imagery training they conducted during this study. Skill level with the specific type of shot might be a reason why there were differences in performance results between 2-point and 3-point shooting in Study 2. An adequate level of skill is necessary to be able to apply imagery effectively. Participants in Study 2 appeared to have the skill in 2-point shooting, based on their experience in 2-point shooting roles in matches, that allowed them to use imagery to improve their performance of 2-point, but not 3-point shooting, whereas more skilled participants in Study 1 had sufficient skill at 3-point shooting to improve both 2- and 3-point shooting with imagery of both types of shooting.

Researchers have studied the relationship of skill level to the impact of imagery interventions and performance. For example, Koehn and Morris (2014) studied the effect of performance context and skill level on the frequency of flow experience in young tennis players. They found that the flow experience of lower-skill athletes revealed a similar, relatively low frequency across performance contexts, whereas advanced athletes experienced flow more often during training than competition.

An important difference between the results of Study 1 and Study 2 was that, whereas imagery enhanced performance of 3-point shooting more than 2-point shooting in Study 1, in Study 2, 3-point shooting hardly changed at all, but 2-point shooting showed significant improvement from pre-test to post-test in the Imagery intervention condition. One possible explanation for this difference could relate to the skill level of the participants in the Imagery condition in each study. The participants in Study 1 were more skilful shooters than those in Study 2. Thus, they were probably at a level where their 3-point shooting skill was sufficient for them to take advantage of the imagery training to improve their performance. The participants in Study 2 were somewhat less skilled shooters, so they might not have been able to take similar advantage of the imagery training when applied to their 3-point shooting, as they did for 2-point shooting, and as the participants in Study 1 did for 3-point shooting. This suggests that skill level should be monitored in relation to the specific task in imagery studies to determine how sensitive imagery training is to individuals' skill level in the specific task. Gregg and Hall (2007) reported a relationship of skill level to the use of imagery in golfers. Using the Sport Imagery Questionnaire (SIQ; Hall et al., 1998), Gregg and Hall assessed the five functions of imagery (cognitive specific, cognitive general, motivational specific, motivational general –arousal, motivational general-mastery imagery). Results indicated that low handicap (higher skill level) was significantly related to increases in use of all five functions of imagery.

In Study 3, the focus of the imagery intervention was on sense of control, one of the five flow state dimensions that Stavrou and Zervas (2004) proposed as antecedents of flow state. Results indicated that flow state increased for global flow and all nine flow state dimensions, following the Imagery intervention designed to enhance sense of control. In the Imagery intervention condition, seven of the nine flow dimensions significantly increased from pre-test to post-test, the exceptions being merging of action and awareness and clear goals. The Imagery condition had significantly higher flow and performance than the Video Placebo condition at pre-test, as well as at post-test. This produced several main effects of conditions. There was a significant main effect of occasion for almost all flow dimensions. Participants showed no interaction effects in any flow dimensions. Thus, the Imagery and Video conditions revealed no significant difference in the extent of change from pre-test to post-test. The Video condition participants were lower at pre-test and lower by about the same amount at post-test on most flow dimensions. It is possible that the higher mean for most flow dimensions and for performance in the Imagery condition at pre-test meant that those outcome variables experienced a ceiling effect, rising throughout the intervention as they approached post-test, but reaching an upper limit. This does not explain why the Video condition in Study 3 increased from pre-test to post-test. This contrasts with Study 2 in which the same Video condition hardly increased at all for most outcome variables. One possible conclusion from these results is that the increase from pre-test to post-test represents a practice effect in both conditions. Given the absence of such an effect for the Video condition in Study 2 and the incidental observational learning effect as an explanation of the increases observed with the original Video condition in Study 1, an alternative explanation is that the pre-test to post-test increases observed for both conditions in Study 3 represent effects of the interventions. In the case of the Imagery condition this would reflect the impact of performing imagery on sense of control and consequently on most flow state dimensions, whereas in the Video condition it would most likely be due to a motivational effect of watching highly-skilled basketball players, performing at a high level, even without any video of shooting. Such a motivational effect in Study 3, and possibly in Study 1, but not in Study 2, would have to be accounted for by differences in motivational variables not monitored in the studies in this thesis. For example, high levels of the motivational general-mastery imagery function among players in the Video condition in Study 3 might have encouraged them to perform motivational general-mastery imagery, as a consequence of watching the videos. Motivational general-mastery imagery has been shown to enhance confidence, leading to increased performance (Hammond, Gregg, Hrycaiko, Mactavish, & Leslie-Toogood, 2012; O, Munroe-Chandler, Hall, & Hall, 2014). Findings that raise some doubts about the motivational explanation for the increases from pre-test to post-test in the Video condition in Study 3 are that there were no similar increases observed for performance measures in Study 3. Whereas I observed clear increases from pre-test to post-test for 2-point, 3-point and total shooting in the Imagery condition, changes were minimal from pre-test to post-test in the Video condition. If there was a motivational effect of watching highly-skilled basketball players on the videos, it might be more likely to affect performance than flow state variables.

Another noteworthy finding of this thesis was that in both Study 1 and Study 2 participants in the Imagery condition scored higher on flow experience on all nine dimensions of the FSS-2 than participants in the Video condition. This is another indication that imagery interventions can be a useful way to enhance flow state. The findings also showed that pre-test to post-test differences were not as great in Study 3, as they were in Study 1 and Study 2. However, Study 3 showed that all flow state dimensions increased in the Imagery condition and, although scores in the Imagery condition were higher at pre-test than scores in the Video condition, Imagery condition scores stayed higher than Video Placebo condition scores at post-test, except for transformation of time.

Global Flow State and Flow State Dimensions

To examine further the overall patterns of results for the studies in this thesis for global flow state and flow state dimensions, Table 6.1 illustrates the difference between pre-test and post-test means for the Imagery and Video conditions in all three studies. With reference to global flow state, the mean for each antecedent Imagery intervention condition is considerably higher than the mean for the corresponding Video condition, even in Study 1, where there appeared to be clear effects of the Video condition on flow variables. These findings of the current thesis are consistent with the results of a number of studies that have examined the impact of imagery and related interventions, such as hypnosis, on global flow state (e.g., Pates et al., 2002; Pates et al., 2001; Pates & Palmi, 2002). Design of imagery interventions to specifically target flow state dimensions is new to the present research, as is the focus on measurement of flow dimensions as outcome variables. The results for global flow state and the flow state dimensions raise several points. First, aside from time transformation in Studies 1 and 3, the other 25 flow state dimension differences showed higher levels of flow for the Imagery condition than the corresponding Video condition. When viewed in this way, the consistent increases in flow state dimensions represent an issue that is worthy of note. At the same time the absence of differences for the time transformation dimension in two studies is a salient point. Secondly, the strongest effects of the Imagery condition for global flow and all flow dimensions clearly occurred in Study 2, the total concentration Imagery intervention. In all cases, participants in the Imagery condition showed higher levels of flow experience than did participants in both Study 1 and Study 3. The large increases between pre-test and post-test means for the flow dimensions indicates that respondents frequently experienced flow during post-test performance after the Imagery intervention, which they reported in the FSS-2 that they completed immediately followed post-test. It should be noted that Table 6.1 also shows that the pre-test to post-test differences in flow state dimensions for the Video condition are generally smaller than those in the Imagery condition. In addition, although negative changes from pre-test to post-test are not common, they only occur in the Video condition.

In the 20 years since the development of the quantitative measures of flow state, namely the FSS and the FSS-2, considerable focus has fallen on the concept of flow in relation to sport, both in terms of understanding how the ephemeral process of global flow is generated and in terms of examining its link to performance. The key antecedents of flow have been proposed in a small number of studies (Fong, Zaleski, & Leach, 2014; Stavrou & Zervas, 2004), but no systematic examination has been undertaken to test whether enhancing these proposed antecedents facilitates the experience of flow in sports tasks. No systematic research has been conducted on the application of imagery to increase specific dimensions of flow. In the original research in this thesis, I aimed to enhance knowledge about the mechanisms underlying flow in sport by systematically examining the effect on the experience of specific flow state dimensions of using imagery interventions to enhance the psychological antecedents of flow. In this thesis, I have argued that research on the efficacy of imagery interventions that focus on enhancing flow state is not common, but those studies that have been reported focus on global flow state. In all three studies in the present thesis, I focused on the measurement and analysis of the nine flow state dimensions, where imagery interventions do not seem to appear in the published literature. Given that the main aim of the thesis was to examine the proposition that interventions targeting the five antecedent dimensions of flow state should facilitate the experience of the targeted dimension(s) and global flow state, it was essential to examine at least those flow state dimensions. I have also raised questions concerning whether certain flow state dimensions influence the level of other dimensions. This could occur because they are antecedents of flow that could affect concomitants to enhance the overall experience of flow, that is, global flow state. There are alternative arguments that could relate to the effects of one flow state dimension on other flow experiences, such as the proposal that total concentration is closely related to the essence of flow, which involves being totally immersed or absorbed in an activity (Csikszentmihalyi, 1990). These suggestions supported the examination of all nine flow state dimensions in all three studies.

Table 6.1.

FSS-2 Difference Scores from Pre-test to Post-test for the Imagery and Video Conditions in Studies 1, 2, and 3

Flow subscales	Imagery Condition			Video Condition		
	Scores (Post-test - Pre-test)			Scores (Post-test - Pre-test)		
	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3
C-S Balance	2.91	3.60	0.8	1.00	0.67	0.47
Merging of Action awareness	2.18	3.60	0.8	1.34	0.27	-0.14
Clear Goals	2.00	2.73	0.6	0.74	-0.06	0.14
Unambiguous Feedback	2.46	3.27	1.33	0.60	-0.54	0.54
Concentration on the task at hand	1.18	3.47	1.33	0.40	-0.07	1.07
Sense of Control	1.82	3.94	1.13	1.53	0.47	0.67
Loss of Self Consciousness	2.00	3.27	1.40	1.26	1.07	1.00
Transformation of Time	2.81	3.90	0.72	2.47	0.07	0.74
Autotelic Experience	2.10	2.87	1.13	1.40	-0.07	0.87
Global Flow State	19.44	30.69	9.45	10.74	1.81	5.36

Note: Differences result from subtracting pre-test scores from post-test scores. Thus, positive values represent occasions when the outcome flow variable increased from pre-test to post-test and negative values reflect reductions in flow from pre-test to post-test.

As previously noted, the results reported for global flow state in the studies in this thesis are consistent with previous research on flow, which has focused on global flow state as the outcome variable (e.g., Jeong, 2012; Koehn et al., 2016; Koehn & Diaz-Ocejo, 2016). However, I am not aware of other studies that have aimed to enhance global flow state by targeting specific flow dimensions. Although Stavrou and Zervas (2004) proposed that the five flow dimensions targeted in the three studies in this thesis are antecedents that should promote flow, whereas the other four flow dimensions are concomitants that occur once individuals are in flow, interventions to enhance flow are limited and it appears that researchers have not taken up Stavrou and Zervas' challenge to test the antecedents-concomitants distinction. This might be considered surprising, given that the antecedents seem to correspond closely with the major elements of Psychological Skills Training (PST), namely goal setting, concentration, relaxation, and confidence, which have been widely studied and applied in sport psychology practice (Koehn et al., 2016; Stavrou et al., 2015). Thus, there is a range of tried and tested techniques available to enhance specific flow state concomitants, of which probably the most widely studied is imagery. It seems that there is clear logic associated with the approach adopted in the present thesis, namely to examine the flow state antecedents in a set of studies employing equivalent field study research designs, in which imagery is the technique underpinning the active intervention, with a different antecedent(s) in each study. Despite careful planning and control, results of the three studies in this thesis were affected by unexpected extraneous variables. These were the apparent occurrence of incidental observational learning in the Video placebo condition in Study 1 and the occurrence of a substantial pre-test difference between the Imagery intervention condition and the Video condition in Study 3, which had low probability considering the precaution of matching assignment of participants to the Imagery and Video conditions on the basis of demographic variables. Nonetheless, imagery was associated with pre-test to post-test increases in global flow state and most or all flow state dimensions in all three studies, with the most clear-cut effects occurring in Study 2, where all nine flow state dimensions displayed significant interaction effects, indicating greater increases in flow in the Imagery condition than in the Video condition. The promising outcomes of the studies in this thesis, with reference to global flow state and especially the flow antecedent dimensions, warrant further research that focuses on the impact of targeted interventions on one or more antecedent flow dimensions. Given the great flexibility of the application of imagery, substantial further research is possible that applies various kinds of imagery intervention to enhance flow antecedents, using designs similar to those employed in this thesis, but with placebo comparison conditions suited to the context and sport being studied. At the same time, there is potential to examine the impact of other intervention techniques. One such technique is hypnosis, which has shown promising results for enhancing global flow state in previous research (Lindsay et al., 2005; Pates, 2013; Pates & Cowen, 2013; Pates et al., 2002; Pates & Maynard, 2000; Pates, Maynard, & Westbury, 2001; Pates et al., 2001; Pates & Palmi, 2002; Vasquez, 2005). However, the application of hypnosis to enhance flow experiences has not been followed up in published studies to explore the mechanisms underlying its positive effect on global flow state. Studies in which various hypnosis techniques are applied to enhance flow antecedents and then the flow state dimensions are examined, as in the present thesis, would be of great interest.

The examination of flow state at the level of the flow dimensions is an issue that should be explored further to enhance understanding of the quantitative measurement of flow. Much of the early research on flow in sport was conducted using qualitative techniques, mainly interviews and the Experience Sampling Technique (e.g., Jackson, 1992, 1995; Jackson, & Roberts, 1992).

In sport, the development of the FSS/FSS-2 and the DFS/DFS-2 (Jackson & Eklund, 2002; Jackson & Marsh, 1996) ushered in a new era of quantitative research into flow. The approach adopted to construct these scales appears logical, basing the items in each measure on the nine flow dimensions identified by Csikszentmihalyi (1975). The psychometrics are sound, especially for the FSS-2 (Jackson & Eklund, 2002). Thus, the FSS-2 has been widely employed in research on flow state in sport. Notably, almost all this research has examined global flow state (e.g., Jeong, 2012: Koehn et al., 2013; Lindsay et al., 2005; Pates et al., 2002; Pates & Maynard, 2000; Pates, Maynard, & Westbury, 2001; Pates et al., 2001; Vasquez, 2005). However, careful consideration of the conceptualization of the FSS-2 suggests that global flow state might not be as pure a measure as seems to be assumed by most researchers who have worked on flow state in sport. Adding together the nine flow dimension subscales, with their great diversity from relatively objective variables, including clear goals and unambiguous feedback, to largely subjective phenomenal experiences, including loss of self-consciousness and time transformation, can lead to a large number of different permutations of high and low scores across the nine dimensions that produce the same global flow state score. For example, it is doubtful that the global flow state score, resulting from high scores on the C-S balance, clear goals, and unambiguous feedback dimensions, with low scores on the loss of self-consciousness, time transformation, and autotelic experience dimensions, reflects the same underlying psychological state as the same global flow state score, resulting from high scores on the loss of self-consciousness, time transformation, and autotelic experience dimensions, with low scores on the C-S balance, clear goals, and unambiguous feedback dimensions. This in itself seems to be a critical issue for examination, but little has been published along these lines, as far as I am aware. Confidence in the meaning of global flow state scores appears to depend on the nine flow state dimensions always being in agreement, that is either they are all scored high, or all moderate, or all low. Aside from the early psychometric studies (e.g., Jackson & Eklund, 2002, Jackson & Marsh, 1996), there does not seem to be much research examining this issue.

One implication of the closer examination of global flow state as a measure that consistently reflects the same underlying psychological state is that researchers should be advised to examine the nine flow state dimensions, as well as global flow state. This has the potential to enhance understanding of the key components of flow that influence global flow state and could provide information that would explain how flow might influence performance. It is for these reasons that I chose to examine the nine flow state dimensions in the present thesis. The finding in Study 2 that all nine flow state dimensions increased when the Imagery intervention was designed to focus only on total concentration, raised further interesting questions that warrant careful examination.

One question that should be explored, using a variety of techniques to measure flow, is whether there are causal relationships between some or all flow dimensions. Some researchers have recently argued that C-S balance, clear goals, and unambiguous feedback are the pre-eminent flow dimensions, which must be present for flow to occur (Engeser, 2012; Hassmen, Keegan, & Piggott, 2016; Schiefele, 2013). Reflecting on the results of Study 2, total concentration on the task is closely related to terms that have been proposed to represent the essence of flow experiences, namely total immersion and total absorption in the task. This suggests that perhaps total concentration is a core dimension of flow that could trigger other psychological processes, such as loss of self-consciousness and time transformation, which have also been classified as flow state dimensions (Csikszentmihalyi, 1975), but have been labelled concomitants by Stavrou and Zervas (2004), suggesting that they arise as a consequence of processes that promote flow. Researchers should devise studies to examine the causal relationships between flow state dimensions. This would certainly be a challenging task given the ephemeral nature of the flow experience and the consequent difficulty in measuring flow uncontaminated by performance in sport. The development of a body of research that examines the nine flow state dimensions is essential to address these issues. This is beyond the remit of this thesis, which is focused on testing the efficacy of imagery as a means of enhancing the five flow antecedents proposed by Stavrou and Zervas (2004). In Study 2, an imagery intervention designed to promote total concentration on the task did enhance the total concentration flow dimension. However, this intervention also enhanced the other eight flow dimensions, through mechanisms as yet unidentified. The imagery interventions in Study 1 (C-S balance, clear goals, unambiguous feedback) and Study 3 (sense of control: confidence, calmness) also produced increases in flow state dimensions that were not targeted, as well as enhancing the targeted dimensions. These studies stimulate further questions about the possible causal relationships between flow state dimensions that would be of great interest to explore further.

Basketball Shooting Performance

I decided to examine the differences for basketball-shooting performance from pre-test to post-test for the Imagery and Video conditions across the three studies in this thesis to identify any patterns. The results of subtracting the pre-test mean from the post-test mean for each flow dimension for the Imagery condition and the Video condition are presented in Table 6.2. The pre-test to post-test differences in Table 6.2, reflect the significant conditions x occasions interaction effects for shooting performance in all three studies, in which participants in the Imagery condition showed larger increases in basketball shooting performance than those in the Video condition, except for 3-point shooting in Study.

Table 6.2

Summary of Shooting Performance Difference Scores from Pre-test to Post-test in the three Studies

Shooting Performance	Imagery Condition			Video Condition		
	Improvement (post - per)			Improvement (post - per)		
	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3
2 - point	9.09	6.00	6.33	5.60	-1.34	1.67
3 - point	15.28	2.14	7.47	8.66	1.86	1.53
Total	25.27	9.87	13.80	12.20	0.54	3.2

In Study 1, there was a substantial improvement in 2-point, 3-point, and total shooting performance. This way of examining the basketball shooting results indicated that the clear goals Imagery intervention produced larger increases in performance than the concentration and sense of control Imagery intervention conditions. This was especially demonstrated for 3-point shooting in Study 1. However, this pattern should be qualified. First, the samples in each study were different and might have varied in ways that affected the effect of the Imagery intervention on performance. In particular, the sample in Study 1 was more highly skilled than the samples in Studies 2 and 3, so the participants in the Imagery condition probably had greater potential to imagine the processes described in the imagery script and benefit from the intervention. This was evident in 2-point shooting, but it was illustrated most clearly in 3-point shooting, where they showed the most noteworthy increase in performance. The second point to note is that the Video condition was changed after Study 1 to remove video of NBA players shooting baskets, which appeared to have an impact. Thus, although the Imagery intervention in Study 1 resulted in larger pre-test to post-test changes in basketball-shooting performance than was observed in shooting performance in Studies 2 and 3, the pre-test to post-test increases in the Video condition were also largest in Study 1. The examination of pre-test to post-test differences for Study 2 and Study 3 suggests that patterns of change are very similar to each other, showing moderate increases in the Imagery condition and small changes only, in the Video condition. The exception, as noted previously, is the relatively small change from pre-test to post-test for 3-point shooting in Study 2. This was accounted for earlier as possibly being due to the lower skill level of the league competition basketball players who volunteered to participate in Study 2 compared with Study 1 participants. Another qualification is that the three studies were conducted with different samples and differences in key variables, such as skill level. However, the participants in Study 1 appeared to have higher skill level than the participants in Study 2 and Study 3, who, nonetheless, showed a pre-test to post-test increase in 3-point shooting that was substantially greater than that in Study 2, but still much smaller than the increase shown by participants in the Imagery condition in Study 1. This does bring into question the skill-level explanation of these differences. It should be borne in mind that statistically the most powerful results occurred in the total concentration Imagery intervention in Study 2, where changes in the Video Placebo condition were small, and marginally negative in the case of 2-point shooting.

Methodological Considerations

It is not appropriate to revisit in detail here the issues that I raised, regarding aspects of the method used in each of the studies in this thesis that unintentionally influenced, or appeared to influence, the outcomes of the studies. However, I consider that it will be helpful to researchers, examining the effect of imagery interventions on flow dimensions and performance in sport, to briefly highlight important lessons learned in this thesis.

The first observation is that it is always important to include an introduction that explains what imagery is and how it works, preferably with a physical demonstration, such as the “arm as iron bar” or “string-and-bolt” exercise, to ensure participants are convinced that it is worth making an effort to practice imagery to the full extent of the instructions in the study they are undertaking (Morris et al., 2005). Researchers who have undertaken many imagery studies might come to take individuals' belief in the efficacy of imagery for granted, but participants could be naive. On the other hand, novice researchers in imagery might not appreciate the importance of such an introduction, which is not often mentioned in published studies. I had to exclude four participants from the Imagery intervention condition in Study 1, after the study, because they admitted in the debriefing interviews that they did not think that the Imagery intervention would have any effect, so they stopped doing it after the first one or two sessions. Fortunately, those participants were honest with me. If they had just kept quiet, the results of Study 1 could have looked quite different and rather disappointing.

This leads to a related point, namely that the inclusion of brief post-study interviews can be helpful in a number of ways. Such interviews are standard practice in single-case design (SCD) studies (Hrycaiko & Martin, 1996), but are not often employed in experimental design studies, whether laboratory- or field-based. Unless designs are "water-tight", which is rare, it is always useful to check that participants did what they were instructed to do, as a manipulation check. As just reported, it is always possible that some participants did not follow the instructions for their research condition, either because they did not have the capacity to do so or because they made a volitional decision to abstain. If researchers do not check, participants might not voluntarily reveal their lack of compliance. Post-study interviews can also play an important role of enriching information about participants' thoughts, feelings, and behaviour during the study that might clarify puzzling outcomes derived from quantitative analyses.

Great care needs to be taken in choosing placebo control conditions to compare with the effects of imagery interventions. It is challenging to find activities that are sufficiently interesting to participants in such control conditions to ensure that they do not become bored, and sufficiently meaningful that participants believe they are undertaking a beneficial activity in relation to the sports task under examination. Because I gave no instructions to participants in the Video placebo condition in Study 1 to encourage them to apply their observation of the worlds best players performing successful basketball shooting in open competition play, I did not expect them to learn anything or even to be motivated by watching the videos. However, these relatively skilled performers seemed to learn something about shooting technique or at least feel motivated by watching the best players perform successfully. Thus, it was necessary to modify the content of the video in Studies 2 and 3 to exclude shooting among NBA players, instead of focusing on it. Of course, I included pilot work to test all the research conditions I employed, but perhaps more extensive pre-study testing is necessary in future research.

In all three studies, I assigned participants to the Imagery intervention condition and the Video placebo condition using a random process, after matching participants in pairs based on demographic variables, including their club and playing position. In Studies 1 and 2, the random assignment was effective, but in Study 3 it resulted in participants in the Imagery intervention condition having higher means on most of the flow dimensions and, as a result, also on global flow state, at pre-test. This could have had a noteworthy impact on the outcome of the intervention. It certainly led to there being main effects of condition for most flow variables, with the Imagery intervention being significantly higher at pre-test and post-test than the Video placebo condition. There were no significant interaction effects for global flow state or any flow state dimensions in Study 3, which would have been the clearest indicator of an effect of the Imagery intervention condition on flow experience compared to the Video condition. In future research involving comparisons between imagery interventions and control or placebo conditions, it is recommended that participants should be assigned to research conditions using pre-test matching on the outcome variables of interest to minimize the chance of significant pre-test differences that could impact on the whole study. In pre-test – intervention – post-test designs, the outcome variables are measured at pre-test, which provides the basis for matching. However, a challenge for this kind of matching, when flow dimensions are the focus of the outcomes of the intervention, is that it is very difficult to match individuals on nine different variables. One alternative would be to match participants into research conditions on the basis of global flow state at pre-test. However, the same global flow state could reflect many different combinations of flow dimension scores, as discussed in the previous flow section of this chapter. This could result in little extra control over the flow dimensions than using random assignment of participants. Another approach might be to match participants on the basis of the one or two flow dimensions that are the focus of the particular study. This should ensure that the main variables of interest do not suffer from the consequences of pre-test significant differences between research conditions. It would mean that there was no control over the other flow state dimensions, however.

Further Research

Important implications for future research have emerged from the three studies in this thesis in terms of flow dimensions, imagery, and performance. Promising findings from the studies in this thesis reflect the potential for future research on use of imagery to promote the five antecedents of flow state to increase flow experience and shooting performance. This original research aimed to enhance knowledge about the mechanisms underlying flow in sport by systematically examining the effect on the experience of flow state of using imagery interventions to enhance a specific flow antecedent(s) in each study. In examining the nine flow state dimensions, as well as global flow state, in each study, this research demonstrated how monitoring flow state dimensions has the potential to increase understanding of how imagery enhances flow state and basketball shooting performance. At the same time, the results of the studies in this thesis raised a number of issues that should stimulate further research about the experience of flow and, particularly, the nine flow dimensions that I studied in this thesis.

First, the sample in each study represented participants with differences in skill level, playing or competitive experience, and basketball-shooting training hours during the study. Skill level differences were not measured in a systematic way and all the participants in the three studies in this thesis played in the same three divisions in the same Melbourne league. However, on closer examination, I considered the participants' skill levels to vary more than appeared at first sight. This was related to the relative breadth of skill of participants in the three divisions, as well as the participants' competition experience. Some participants were very experienced players who had played at higher levels that this local league, but were playing less seriously than in the past, whereas others were inexperienced, but promising players moving up the basketball competition hierarchy. It is likely that the highly experienced, as well as the more highly-skilled, players had more potential to apply the imagery interventions and benefit from them in terms of increases in flow experience and the basketball-shooting performance tests. Thus, further research should be conducted, using the design employed in the present thesis to systematically examine the impact of skill level on imagery interventions intended to enhance flow experience and improve sports performance. In order to adequately measure skill level, more sophisticated techniques should be employed than simply noting the division, or equivalent, in which they play. To undertake sufficient research to observe patterns of flow and performance, studies should be conducted in a range of sport contexts. Target sports like basketball, netball, shooting, archery, darts, golf putting, and ten-pin bowling have the advantage of providing objective outcomes that can be monitored relatively easily to identify changes in performance. At the same time, the tasks involved provide an environment in which flow state can be experienced and enhanced.

Secondly, the findings of Study 1 were promising, although they could be more clear-cut, if replicated, with video placebo conditions that do not induce any active effects. However, the question arises from the design of Study 1, in which the Imagery intervention combined three antecedents of flow, namely C-S balance, clear goals, and unambiguous feedback, whether the combination of the three antecedents is important or whether, perhaps, imagery interventions that focus entirely on clear goals would be at least as effective as the three-pronged imagery content of Study 1. It seems that the key element of that imagery script was setting clear goals because setting clear goals that establish the challenge to match each participant's skill level, and with a clear and unambiguous outcome, effectively set an appropriate C-S balance and permit participants to acquire unambiguous feedback. Thus, studies similar in design to Study 1 could examine whether imagery training would be as effective if it focused only on clear goals, assuming that, if the goals are appropriate, participants will automatically perceive a C-S balance and it will be clear what outcome is expected, so feedback should be unambiguous. Imagery scripts based on clear goals could be compared with the kind of imagery script employed in Study 1, in which the C-S balance and unambiguous feedback aspects are explicitly stated and participants focus on them equally alongside clear goals. Flow state dimensions would be among the outcome variables to determine, in particular, whether clear goals increases more when it is the sole focus of the imagery script than when it is part of a three-pronged script, and whether C-S balance and unambiguous feedback are enhanced more when they are explicit parts of a three-pronged script than when they are implicitly enhanced in a clear goals only script.

In the studies presented in this thesis, I examined the impact of imagery scripts that included both process and outcome content. All the imagery scripts instructed participants to focus on their usual process of shooting in basketball, feeling the movements involved and imagining successful outcomes of the shots. It is possible that imagery of the process of performing a skilled task, basketball-shooting, had more impact on global flow state and flow state dimensions than imagery of the successful outcome. One reason why this might be the case is that researchers have found that, in qualitative studies, participants report that when they are in flow they become absorbed in the process of performing the task and have little concern about the outcome, even during competition (e.g., Jackson, 1992, 1995). However, researchers have demonstrated that imagery of successful outcomes of performing sports skills can lead to improved performance (e.g., Koehn et al., 2013, Kuan, Morris, Kueh, & Terry, 2018*).* This could lead to a conflict between increasing the experience of flow and improving performance in imagery scripts that include imagery of both process and outcomes. To examine this, it would be interesting to conduct studies that compare imagery scripts that focus on the process of performing sports skills, while ignoring outcomes, with studies that focus on outcomes with little or no content about the process of performing the skill. It might be predicted that imagery scripts with a process focus would enhance flow dimensions, while leaving performance relatively unchanged, whereas imagery scripts with an outcome focus would improve performance with little change in flow experience. Of at least equal interest, is the possibility that, when presented with imagery scripts that include equivalent proportions of process and outcome content different participants might focus more on the process or the outcome content, leading to variable results in terms of flow experience and performance. This could be explored by conducting studies like the ones in the present thesis that include process and outcome imagery content, and in which global flow state and the nine flow state dimensions are measured, along with performance. Then interviews could be performed that delve into participants' imagery in detail to determine whether they employed primarily process or outcome imagery, or used both equally. Researchers who are blind to the participants' flow state scores and performance should conduct the interviews. Then the patterns of imagery that participants report could be compared with the changes that quantitative flow state and performance measures produce, to examine whether differences in those measures vary with self-reported focus of participants on process or outcome. If systematic patterns emerge from such research, further exploration could be undertaken to identify the variable or variables that lead participants to focus on process or outcome imagery.

Another important direction for further research that emerged from the studies conducted in the present thesis concerns possible causal relationships between flow dimensions. As noted in the section on global flow state and flow state dimensions in this chapter, although I focused the imagery intervention in Study 1 on three antecedent dimensions of flow state (C-S balance, clear goals, unambiguous feedback), the imagery intervention in Study 2 on total concentration and the imagery intervention in Study 3 on sense of control, in each study some or all of the other flow dimensions also changed in a positive direction from pre-test to post-test. It would be informative to conduct research to determine whether this pattern of increases in flow experience arises because elements of the imagery scripts or the participants' imagery guided by the imagery scripts independently triggers increases in a range of flow state dimensions or whether the imagery that participants undertake enhances the targeted flow state dimensions, which then trigger increases in other flow state dimensions. As proposed earlier in the thesis, this issue might be addressed by research designs in which imagery interventions continue for longer periods than was the case in the studies in this thesis, for example, with two imagery sessions per week for six or eight weeks, and in which performance followed by flow state dimensions are measured regularly, for example, after the second session of each week. This would permit analysis to be conducted examining the patterns of change in all nine flow state dimensions from week to week to determine whether some flow state dimensions consistently change earlier in the imagery training program than others across a number of studies. Positive results from such research would provide an argument for larger scale studies that would permit causal modelling to be conducted to produce more conclusive evidence for causal relationships between flow state dimensions.

Implications for Practice

The findings in this thesis highlight some positive strategies that could help sport psychologists and coaches to use imagery training effectively with athletes to enhance their flow experiences and improve their performance. The importance of flow in sport is based on the experience of enjoyment, leading to increases in intrinsic motivation. Because enjoyment of an activity, for the pleasure and satisfaction of participating, and high levels of intrinsic motivation, which focuses on the motivation to perform an activity for its own sake, are positive outcomes, flow is appealing to coaches and athletes. Experience of a high level of flow leads to strong commitment to practice, and greater effort and persistence in competition, even in the face of failure.

In the three studies in the present thesis, imagery training was associated with substantial increases in levels of all or some of the nine flow dimensions from pre-test to post-test, compared to video placebo conditions. The imagery scripts in the three studies in the present thesis included a focus on imagery of the process of the skill of basketball shooting and imagery of successful outcomes from basketball shooting. This combination proved to be effective for enhancing global flow state and flow state dimensions, as well as performance. The implication is that a combination of process and outcome imagery was effective in this context. However, further research should be conducted on the relative efficacy of a focus on either process imagery or outcome imagery for enhancing flow experience, on one hand, and performance on the other. Substantial and significant increases in performance and increases in global flow state and some or all flow state dimensions occurred in a situation in which skilled basketball players were instructed to imagine employing their usual basketball-shooting technique. This suggests that skilled players should not be presented with imagery that includes details of the desired technique. This approach is likely to interfere with the automatized production of shooting skill at this level. Further, the results suggest that as few as six 15-minute sessions over two weeks can have a very positive outcome for flow and particularly for performance. This does not mean that more frequent sessions per week or a longer period of undertaking imagery, such as four or six weeks, will not have greater effects (see Wakefield & Smith, 2011).

Although imagery training was shown to be effective in the studies in this thesis, athletes, coaches, and sport psychologists should be aware that not all individuals can benefit from imagery training. In all three studies in this thesis, I adopted the common practice of screening for at least moderate imagery ability among potential participants, using the SIAM. Low scorers on an imagery ability measure like the SIAM may not be able to apply the imagery content of imagery interventions to enhance flow state or performance (Morris et al., 2005). Skilled athletes tend to report higher levels of imagery ability, which has been associated with their greater experience (Watt et al., 2018), so I did not have to exclude any participants from the studies in this thesis. Nonetheless, I recommend that researchers and practitioners should screen individuals, using a measure like the SIAM, to ensure that they are suitable for imagery training. Low scorers on imagery ability might progress more effectively with an alternative technique, such as positive self-talk, which is based on verbal, as opposed to imagery, processes (Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011; Taylor, Brinthaupt, & Pennington, 2018; Woodman, 2015).

Each study in this thesis examined a different antecedent of flow state, in fact, I examined three antecedents in Study 1. Consistent with the proposition by Stavrou and Zervas (2004), results indicated that imagery interventions that focused on the antecedent flow dimensions were effective in enhancing the targeted flow dimension(s), as well as other flow dimensions and global flow state, and the interventions were associated with increases in performance of basketball shooting. These results provide support for the proposition that these five flow dimensions are antecedents of flow experience. Thus, sport psychologists, coaches, and athletes should apply the antecedents individually to enhance the experience of flow in basketball. Nonetheless, further research is warranted to explore the mechanisms by which the antecedents enhance flow state and such research should be conducted in a number of different sport contexts.

Although the examination of the nine flow state dimensions as outcome variables raised some interesting questions for further research, the information gleaned by monitoring the dimensions of flow state, rather than relying on the conglomerate measure of global flow state, seems to be fruitful. I certainly recommend researchers to examine flow state dimensions in their future work to unravel the intricacies of flow. Moreover, I advise practitioners that initial screening of the flow state dimensions with individual clients, and monitoring of changes that occur as interventions with those clients progress, will give the practitioners much greater understanding of how those individuals are responding to interventions, such as imagery, allowing more precise fine-tuning of interventions to suit different individuals, leading to greater enjoyment and higher levels of intrinsic motivation that contribute to individuals sustaining long-term participation in their sport.

Concluding Remarks

The research in this thesis was designed to extend understanding of how imagery can be used to enhance flow in sport by examining the impact of using flow antecedents during imagery to increase global flow state, flow dimensions, and basketball shooting performance. Furthermore, using qualitative methods, I explored athletes' experience and opinions regarding the usefulness of practising imagery of specific flow antecedents. Through three studies, I found great potential of imagery training, focusing on flow antecedents. To conclude, the present thesis showed that there is promise in the use of imagery programs based on flow antecedents for enhancing global flow state and flow state dimensions, which might also improve performance. Nonetheless, there is much still to be learned about how to deliver flow antecedent imagery training. Given the well-established impact of flow state on enjoyment of, and increased intrinsic motivation for, all sports, I hope that other researchers will take up the challenge of finding the most effective ways to deliver imagery to enhance flow to increase enjoyment and intrinsic motivation, as well as performance, for many sports performers.

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Appendix A

Invitation letter for Studies 1, 2 and 3

Invitation letter

Dear Basketball player

Re: Enhancing Flow and Basketball Shooting

Flow is the feeling athletes get when they are totally absorbed in their sport, whether in training or competition. Flow is important because it has three effects that support players, namely enjoyment, motivation, and performance enhancement. When players experience flow they find basketball highly enjoyable and want to play again. Such high levels of enjoyment are related to wanting to do more training, to practice more often, and to compete more just for the pleasure and satisfaction of playing (intrinsic motivation). Training and competing more, especially with a sense of enjoyment, often leads to better performance. Because increasing enjoyment, motivation and performance are things we all want, it is important to promote flow to occur. We are studying techniques that will help players to experience flow more often and which could also lead to improved shooting performance.

We want to invite you to participate in this study. Participation involves doing a test of basketball shooting and completing a short questionnaire on flow, then doing six sessions using techniques related to flow and shooting, and finally doing the shooting test and flow questionnaire again.

We assure you that all responses will be confidential and you can withdraw at any time you wish.

This study is part of the Doctor of Philosophy program of Phatsorn Waraphongthanachot, supervised by Professor Tony Morris and Dr Tony Watt at Victoria University.

If you are interested to hear more about how you can take part in this important research on flow and basketball shooting, please contact Phatsorn on Tel: 0406426945 or Email: lens2013mel@gmail.com and she will be happy to give you more information.

Thank you in anticipation of your interest

Yours sincerely,
Phatsorn Waraphongthanachot

Any queries about your participation in this project may be directed to the researcher (Name: Phatsorn Waraphongthanachot phone number + 61 0406426945) or Supervisor (Name: Prof Tony Morris Phone number + 61 0430511543). If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University of Technology, (Phone number: + 613-99194148) PO Box 14428 MC, Melbourne, 8001, Australia.

Appendix B

Information Statements for Study 1

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

Information Statement for Participants: Study 1 (Imagery Condition)

You are invited to participate

You are invited to participate in a research project entitled Enhancing Flow and Basketball Shooting Performance.

This project is being conducted by a student researcher Phatsorn Waraphongthanachot as part of a doctor of philosophy PhD at Victoria University under the supervision of Professor Tony Morris from the College of Sport and Exercise Science and Dr Anthony Watt of the College of Education at Victoria University.

Project explanation

Mientkiewicz, a baseball player in the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:, “I was like Wow, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion.” Research has shown that enhancing flow can lead to increases in enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enhancing flow is also an important goal in sport because of its link with high performance. In this research we investigate the use of imagery to enhance aspects of flow state that are likely to support basketball players’ shooting performance. This involves imagining you know what you aim to achieve in shooting, that is, your goals, and imagining you can achieve those goals based on your shooting skill level.

What will I be asked to do?

As a participant in this study, you will first complete a questionnaire about your imagery, taking 15-20 minutes. Then you will complete a basketball-shooting task, shooting 2- and 3- point shots from various angles. You will have 10 practice shots and 80 trial shots. After that you will answer a questionnaire about your flow state while you were shooting. The basketball shooting will take 8-10 minutes and the flow questionnaire will take 10 minutes. Then you will complete six imagery sessions, three each week (Monday, Wednesday, Friday) over two weeks. On the first occasion, Phatsorn will guide you through the session, which lasts about 15 minutes. You are asked to tell us about your experience of imagery at the end of each session by writing comments in a diary. Then you will complete the basketball-shooting task again followed by the flow questionnaire. At the end of the study, Phatsorn will talk to you briefly about your experiences and performance during the study.

What will I gain from participating?

You are likely to gain greater understanding of flow experience, which should help you to achieve flow in basketball training and competition more often in future. The experience of flow should enhance your enjoyment and motivation for basketball. You should also experience improved shooting performance that could transfer to your game performance in future.

How will the information I give be used?

1. The information form is used to collect details about your gender, age, basketball playing level, years or competition, and frequency of practice.
2. The imagery questionnaire is used to examine your use of imagery in basketball.
3. The basketball shooting performance task examines your shooting of 80 shots from 5 angles around the key at two distances.

4. The flow questionnaire asks you to describe your flow experience while doing basketball shooting.

The information gathered will be used in Phatsorn's PhD thesis. It will also be presented at conferences and published in academic journal articles. In all cases the information will be part of group statistics, so your responses will not be identifiable at all. Presenting the findings of the study in these ways helps researchers, sport psychologists, coaches and athletes to learn more about flow, which can improve the experience of many athletes in future.

How will this project be conducted?

Following your consent to participate in this project, you will complete a short form giving information about yourself and then do a questionnaire on your imagery. After that you will perform the basketball-shooting task and report your flow during performance of that shooting task in a questionnaire. Then we will discuss suitable goals for shooting that you should aim for based on your performance, and you will do six imagery sessions in which you will imagine achieving those goals. Then you will do the shooting task again and describe your flow once more. Finally, you will discuss your experience with Phatsorn.

What are the potential risks of participating in this project?

This study has low risk to you because the shooting performance is similar to routine sport activities, so there is only minimal risk of physical harm, such as muscular soreness, as in normal training. You might be concerned about answering questions in the imagery and flow questionnaires, but these ask for your own personal experience, so there are no right or wrong answers, just what you think. Your own responses will be compared at the start and the end of the study and nobody else will see you perform or hear the results. The imagery training involves you practising imagery skills, involving similar procedures to many previous imagery studies and what many players do as part of their everyday planning and practice. The content of the imagery script has been piloted with basketball players similar to you and checked by expert coaches to ensure it is correct. All documentation will be given code numbers, so that you cannot be identified - your name will not be related with any information provided by you, and any personally identifying information, such as your signature on the consent form, will be stored separately from the data. To ensure confidentiality, you will be asked not to disclose names or other personally identifiable information about colleagues or coaches.

There are no right or wrong answers to the questionnaires, just your own opinions. If any questions are unclear please ask Phatsorn and she will help you. The basketball-shooting test is similar to drills you do in training and should not be as stressful as shooting in competition. Nonetheless, if you feel distressed with anything in the study you may take a break at any time. If your level of discomfort does not go away, you can withdraw with no reflection on you. If, at any stage during or after the study you wish to speak to somebody not involved in the research, you can also contact a psychologist, Dr Janet Young, Phone 99194762.

Who is conducting the study?

Any queries about your participation in this project may be directed to the Chief Investigator, Professor Tony Morris (Tel: 0430 511 543), the Co-investigator, Dr Anthony Watt (Tel: 0450955497) or the student investigator, Ms Phatsorn Waraphongthanachot (Tel: 0406 426 945).

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Information Statements for Study 2

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

Information Statement for Participants: Study 2 (Imagery Condition)

You are invited to participate

You are invited to participate in a research project entitled Enhancing Flow and Basketball Shooting Performance.

This project is being conducted by a student researcher Phatsorn Waraphongthanachot as part of a doctor of philosophy PhD at Victoria University under the supervision of Professor Tony Morris from the College of Sport and Exercise Science and Dr Anthony Watt of the College of Education at Victoria University.

Project explanation

Mientkiewicz, a baseball player in the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:, "I was like Wow, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion." Research has shown that enhancing flow can lead to increases in enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enhancing flow is also an important goal in sport because of its link with high performance. In this research we investigate the use of imagery to enhance aspects of flow state that are likely to support basketball players' shooting performance. This involves you imagining that you have a total focus on your basketball shooting.

What will I be asked to do?

As a participant in this study, you will first complete a questionnaire about your imagery, taking 15-20 minutes. Then you will complete a basketball-shooting task, shooting 2- and 3- point shots from various angles. You will have 10 practice shots and 80 trial shots. After that you will answer a questionnaire about your flow state while you were shooting. The basketball shooting will take 8-10 minutes and the flow questionnaire will take 10 minutes. Then you will complete six imagery sessions, three each week (Monday, Wednesday, Friday) over two weeks. On the first occasion, Phatsorn will guide you through the session, which lasts about 15 minutes. You are asked to tell us about your experience of imagery at the end of each session by writing comments in a diary. Then you will complete the basketball-shooting task again followed by the flow questionnaire. At the end of the study, Phatsorn will talk to you briefly about your experiences and performance during the study.

What will I gain from participating?

You are likely to gain greater understanding of flow experience, which should help you to achieve flow in basketball training and competition more often in future. The experience of flow should enhance your enjoyment of and motivation for basketball. You should also experience improved shooting performance that could transfer to your game performance in future.

How will the information I give be used?

1. The information form is used to collect details about your gender, age, basketball playing level, years or competition, and frequency of practice.
2. The imagery questionnaire is used to examine your use of imagery in basketball.
3. The basketball shooting performance task examines your shooting of 80 shots from 5 angles around the key at two distances.
4. The flow questionnaire asks you to describe your flow experience while doing basketball shooting.

The information gathered will be used in Phatsorn's PhD thesis. It will also be presented at conferences and published in academic journal articles. In all cases the information will be part of group statistics, so your responses will not be identifiable at all. Presenting the findings of the study in these ways helps researchers, sport psychologists, coaches and athletes to learn more about flow, which can improve the experience of many athletes in future.

How will this project be conducted?

Following your consent to participate in this project, you will complete a short form giving information about yourself and then do a questionnaire on your imagery. After that you will perform the basketball-shooting task and report your flow during performance in a questionnaire. Then we will discuss suitable goals for shooting that you should aim for based on your performance, and you will do six imagery sessions in which you will imagine achieving those goals. Then you will do the shooting task again and describe your flow once more. Finally, you will discuss your experience with Phatsorn.

What are the potential risks of participating in this project?

This study has low risk to you because the shooting performance is similar to routine sport activities, so there is only minimal risk of physical harm, such as muscular soreness, as in normal training. You might be concerned about answering questions in the imagery and flow questionnaires, but these ask for your own personal experience, so there are no right or wrong answers, just what you think. Your own responses will be compared at the start and the end of the study and nobody else will see you perform or hear the results. The imagery training involves practice of non-invasive imagery skills, involving similar procedures to many previous imagery studies and what many players do as part of their everyday planning and practice. The content of the imagery script has been piloted with basketball players similar to you and checked by expert coaches to ensure it is correct. All documentation will be given code numbers, so that you cannot be identified - your name will not be related with any information provided by you, and any personally identifying information, such as your signature on the consent form, will be stored separately from the data. To ensure confidentiality, you will be asked not to disclose names or other personally identifiable information about colleagues or coaches.

There are no right or wrong answers to the questionnaires, just your own opinions. If any questions are unclear please ask Phatsorn and she will help you. The basketball shooting test is similar to drills you do in training and should not be as stressful as shooting in competition. Nonetheless, if you feel distressed with anything in the study you may take a break at any time. If your level of discomfort does not go away, you can withdraw with no reflection on you. If, at any stage during or after the study you wish to speak to somebody not involved in the research, you can also contact a psychologist, Dr Janet Young, Phone 99194762.

Who is conducting the study?

Any queries about your participation in this project may be directed to the Chief Investigator, Professor Tony Morris (Tel: 0430 511 543), the Co-investigator, Dr Anthony Watt (Tel: 0450955497) or the student investigator, Ms Phatsorn Waraphongthanachot (Tel: 0406 426 945).

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Information Statements for Study 3

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

Information Statement for Participants: Study 3 (Imagery Condition)

You are invited to participate

You are invited to participate in a research project entitled Enhancing Flow and Basketball Shooting Performance.

This project is being conducted by a student researcher Phatsorn Waraphongthanachot as part of a doctor of philosophy PhD at Victoria University under the supervision of Professor Tony Morris from the College of Sport and Exercise Science and Dr Anthony Watt of the College of Education at Victoria University.

Project explanation

Mientkiewicz, a baseball player in the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:, “I was like Wow, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion.” Research has shown that enhancing flow can lead to increases in enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enhancing flow is also an important goal in sport because of its link with high performance. In this research we investigate the use of imagery to enhance aspects of flow state that are likely to support basketball players’ shooting performance. This involves imagining you are feeling calm and confident during basketball shooting performance.

What will I be asked to do?

As a participant in this study, you will first complete a questionnaire about your imagery, taking 15-20 minutes. Then you will complete a basketball-shooting task, shooting 2- and 3- point shots from various angles. You will have 10 practice shots and 80 trial shots. After that you will answer a questionnaire about your flow state while you were shooting. The basketball shooting will take 8-10 minutes and the flow questionnaire will take 10 minutes. Then you will complete six imagery sessions, three each week (Monday, Wednesday, Friday) over two weeks. On the first occasion, Phatsorn will guide you through the session, which lasts about 15 minutes. You are asked to tell us about your experience of imagery at the end of each session by writing comments in a diary. Then you will complete the basketball-shooting task again followed by the flow questionnaire. At the end of the study, Phatsorn will talk to you briefly about your experiences and performance during the study.

What will I gain from participating?

You are likely to gain greater understanding of flow experience, which should help you to achieve flow in basketball training and competition more often in future. The experience of flow should enhance your enjoyment of and motivation for basketball. You should also experience improved shooting performance that could transfer to your game performance in future.

How will the information I give be used?

1. The information form is used to collect details about your gender, age, basketball playing level, years or competition, and frequency of practice.
2. The imagery questionnaire is used to examine your use of imagery in basketball.
3. The basketball shooting performance task examines your shooting of 80 shots from 5 angles around the key at two distances.
4. The flow questionnaire asks you to describe your flow experience while doing basketball shooting.

The information gathered will be used in Phatsorn's PhD thesis. It will also be presented at conferences and published in academic journal articles. In all cases the information will be part of group statistics, so your responses will not be identifiable at all. Presenting the findings of the study in these ways helps researchers, sport psychologists, coaches and athletes to learn more about flow, which can improve the experience of many athletes in future.

How will this project be conducted?

Following your consent to participate in this project, you will complete a short form giving information about yourself and then do a questionnaire on your imagery. After that you will perform the basketball-shooting task and report your flow during performance in a questionnaire. Then we will discuss suitable goals for shooting that you should aim for based on your performance, and you will do six imagery sessions in which you will imagine achieving those goals. Then you will do the shooting task again and describe your flow once more. Finally, you will discuss your experience with Phatsorn.

What are the potential risks of participating in this project?

This study has low risk to you because the shooting performance is similar to routine sport activities, so there is only minimal risk of physical harm, such as muscular soreness, as in normal training. You might be concerned about answering questions in the imagery and flow questionnaires, but these ask for your own personal experience, so there are no right or wrong answers, just what you think. Your own responses will be compared at the start and the end of the study and nobody else will see you perform or hear the results. The imagery training involves practice of non-invasive imagery skills, involving similar procedures to many previous imagery studies and what many players do as part of their everyday planning and practice. The content of the imagery script has been piloted with basketball players similar to you and checked by expert coaches to ensure it is correct. All documentation will be given code numbers, so that you cannot be identified - your name will not be related with any information provided by you, and any personally identifying information, such as your signature on the consent form, will be stored separately from the data. To ensure confidentiality, you will be asked not to disclose names or other personally identifiable information about colleagues or coaches.

There are no right or wrong answers to the questionnaires, just your own opinions. If any questions are unclear please ask Phatsorn and she will help you. The basketball - shooting test is similar to drills you do in training and should not be as stressful as shooting in competition. Nonetheless, if you feel distressed with anything in the study you may take a break at any time. If your level of discomfort does not go away, you can withdraw with no reflection on you. If, at any stage during or after the study you wish to speak to somebody not involved in the research, you can also contact a psychologist, Dr Janet Young, Phone 99194762.

Who is conducting the study?

Any queries about your participation in this project may be directed to the Chief Investigator, Professor Tony Morris (Tel: 0430 511 543), the Co-investigator, Dr Anthony Watt (Tel: 0450955497) or the student investigator, Ms Phatsorn Waraphongthanachot (Tel: 0406 426 945).

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Information Statements for Study 1 Control Condition

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

Information Statement for Participants: Video Condition

You are invited to participate

You are invited to participate in a research project entitled Enhancing Flow and Basketball Shooting Performance.

This project is being conducted by a student researcher Phatsorn Waraphongthanachot as part of a doctor of philosophy PhD study at Victoria University under the supervision of Professor Tony Morris from College of Sport and Exercise Science at Victoria University.

Project explanation

Mientkiewicz, a baseball player in the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:, “I was like Wow, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion.” Research has shown that enhancing flow can lead to increases in enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enhancing flow is also an important goal in sport because of its link with high performance. In this research we identify aspects of flow state that are likely to support basketball players’ shooting performance. This involves watching videos of basketball shooting by skilled performers.

What will I be asked to do?

As a participant in this study, you will first complete a questionnaire about your imagery, taking 15-20 minutes. Then you will complete a basketball-shooting task, shooting 2- and 3-point shots from various angles. You will have 10 practice shots and 80 trial shots. After that you will answer a questionnaire about your flow state while you were shooting. The basketball shooting will take 8-10 minutes and the flow questionnaire will take 10 minutes. Then you will watch six video sessions, three each week (Monday, Wednesday, Friday) over two weeks. On the first occasion, Phatsorn will guide you through the session, which lasts about 15 minutes. You are asked to tell us about your experience of imagery at the end of each session by writing comments in a diary. Then you will complete the basketball-shooting task again followed by the flow questionnaire. At the end of the study, Phatsorn will talk to you briefly about your experiences and performance during the study.

What will I gain from participating?

You are likely to gain greater understanding of flow experience, which should help you to achieve flow in basketball training and competition more often in future. The experience of flow should enhance your enjoyment of and motivation for basketball. You should also experience improved shooting performance that could transfer to your game performance in future.

How will the information I give be used?

1. The information form is used to collect details about your gender, age, basketball playing level, years or competition, and frequency of practice.
2. The imagery questionnaire is used to examine your use of imagery in basketball.
3. The basketball shooting performance task examines your shooting of 80 shots from 5 angles around the key at two distances.
4. The flow questionnaire asks you to describe your flow experience while doing basketball shooting.

The information gathered will be used in Phatsorn’s PhD thesis. It will also be presented at conferences and published in academic journal articles. In all cases the information will be part of

group statistics, so your responses will not be identifiable at all. Presenting the findings of the study in these ways helps researchers, sport psychologists, coaches and athletes to learn more about flow, which can improve the experience of many athletes in future.

How will this project be conducted?

Following your consent to participate in this project, you will complete a short form giving information about yourself and then do a questionnaire on your imagery. After that you will perform the basketball-shooting task and report your flow during performance in a questionnaire. Then you will watch six video sessions and you will be given a different basketball shooting performance to watch in each session. Then you will do the shooting task again and describe your flow once more. Finally, you will discuss your experience with Phatsorn.

What are the potential risks of participating in this project?

This study has low risk to you because the shooting performance is similar to routine sport activities, so there is only minimal risk of physical harm, such as muscular soreness, as in normal training. You might be concerned about answering questions in the imagery and flow questionnaires, but these ask for your own personal experience, so there are no right or wrong answers, just what you think. Your own responses will be compared at the start and the end of the study and nobody else will see you perform or hear the results. The videos you will watch include experts performing basketball-shooting skills in matches, using good technique from which you can learn. All documentation will be given code numbers, so that you cannot be identified – your name will not be related with any information provided by you, and any personally identifying information, such as your signature on the consent form, will be stored separately from the data. To ensure confidentiality, you will be asked not to disclose names or other personally identifiable information about colleagues or coaches.

There are no right or wrong answers to the questionnaires, just your own opinions. If any questions are unclear please ask Phatsorn and she will help you. The basketball-shooting test is similar to drills you do in training and should not be as stressful as shooting in competition. Nonetheless, if you feel distressed with anything in the study you may take a break at any time. If your level of discomfort does not go away, you can withdraw with no reflection on you. If, at any stage during or after the study you wish to speak to somebody not involved in the research, you can also contact a psychologist, Dr Janet Young, Phone 99194762.

Who is conducting the study?

Any queries about your participation in this project may be directed to the Chief Investigator, Professor Tony Morris (Tel: 0430 511 543), the Co-investigator, Dr Anthony Watt (Tel: 0450955497) or the student investigator, Ms Phatsorn Waraphongthanachot (Tel: 0406 426 945).

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Information Statements for Study 2 Control Condition

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

Information Statement for Participants: Video Condition

You are invited to participate

You are invited to participate in a research project entitled Enhancing Flow and Basketball Shooting Performance.

This project is being conducted by a student researcher Phatsorn Waraphongthanachot as part of a doctor of philosophy PhD study at Victoria University under the supervision of Professor Tony Morris from College of Sport and Exercise Science at Victoria University.

Project explanation

Mientkiewicz, a baseball player in the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:, “I was like Wow, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion.” Research has shown that enhancing flow can lead to increases in enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enhancing flow is also an important goal in sport because of its link with high performance. In this research we identify aspects of flow state that are likely to support basketball players’ shooting performance. This involves watching videos of general basketball game competition from the US National Basketball Association (NBA) league.

What will I be asked to do?

As a participant in this study, you will first complete a questionnaire about your imagery, taking 15-20 minutes. Then you will complete a basketball-shooting task, shooting 2- and 3-point shots from various angles. You will have 10 practice shots and 80 trial shots. After that you will answer a questionnaire about your flow state while you were shooting. The basketball shooting will take 8-10 minutes and the flow questionnaire will take 10 minutes. Then you will watch six video sessions, three each week (Monday, Wednesday, Friday) over two weeks. On the first occasion, Phatsorn will guide you through the session, which lasts about 15 minutes. You are asked to tell us about your experience of imagery at the end of each session by writing comments in a diary. Then you will complete the basketball-shooting task again followed by the flow questionnaire. At the end of the study, Phatsorn will talk to you briefly about your experiences and performance during the study.

What will I gain from participating?

You are likely to gain greater understanding of flow experience, which should help you to achieve flow in basketball training and competition more often in future. The experience of flow should enhance your enjoyment of and motivation for basketball. You should also experience improved shooting performance that could transfer to your game performance in future.

How will the information I give be used?

1. The information form is used to collect details about your gender, age, basketball playing level, years or competition, and frequency of practice.
2. The imagery questionnaire is used to examine your use of imagery in basketball.
3. The basketball shooting performance task examines your shooting of 80 shots from 5 angles around the key at two distances.
4. The flow questionnaire asks you to describe your flow experience while doing basketball shooting.

The information gathered will be used in Phatsorn’s PhD thesis. It will also be presented at conferences and published in academic journal articles. In all cases the information will be part of

group statistics, so your responses will not be identifiable at all. Presenting the findings of the study in these ways helps researchers, sport psychologists, coaches and athletes to learn more about flow, which can improve the experience of many athletes in future.

How will this project be conducted?

Following your consent to participate in this project, you will complete a short form giving information about yourself and then do a questionnaire on your imagery. After that you will perform the basketball-shooting task and report your flow during performance in a questionnaire. Then you will watch six video sessions and you will be given a different basketball shooting performance to watch in each session. Then you will do the shooting task again and describe your flow once more. Finally, you will discuss your experience with Phatsorn.

What are the potential risks of participating in this project?

This study has low risk to you because the shooting performance is similar to routine sport activities, so there is only minimal risk of physical harm, such as muscular soreness, as in normal training. You might be concerned about answering questions in the imagery and flow questionnaires, but these ask for your own personal experience, so there are no right or wrong answers, just what you think. Your own responses will be compared at the start and the end of the study and nobody else will see you perform or hear the results. The videos you will watch include experts performing basketball-shooting skills in matches, using good technique from which you can learn. All documentation will be given code numbers, so that you cannot be identified – your name will not be related with any information provided by you, and any personally identifying information, such as your signature on the consent form, will be stored separately from the data. To ensure confidentiality, you will be asked not to disclose names or other personally identifiable information about colleagues or coaches.

There are no right or wrong answers to the questionnaires, just your own opinions. If any questions are unclear please ask Phatsorn and she will help you. The basketball-shooting test is similar to drills you do in training and should not be as stressful as shooting in competition. Nonetheless, if you feel distressed with anything in the study you may take a break at any time. If your level of discomfort does not go away, you can withdraw with no reflection on you. If, at any stage during or after the study you wish to speak to somebody not involved in the research, you can also contact a psychologist, Dr Janet Young, Phone 99194762.

Who is conducting the study?

Any queries about your participation in this project may be directed to the Chief Investigator, Professor Tony Morris (Tel: 0430 511 543), the Co-investigator, Dr Anthony Watt (Tel: 0450955497) or the student investigator, Ms Phatsorn Waraphongthanachot (Tel: 0406 426 945).

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Information Statements for Study 3 Control Condition

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

Information Statement for Participants: Video Condition

You are invited to participate

You are invited to participate in a research project entitled Enhancing Flow and Basketball Shooting Performance.

This project is being conducted by a student researcher Phatsorn Waraphongthanachot as part of a doctor of philosophy PhD study at Victoria University under the supervision of Professor Tony Morris from College of Sport and Exercise Science at Victoria University.

Project explanation

Mientkiewicz, a baseball player in the USA team at the 2000 Olympic Games in Sydney, described his flow experience as follows:, "I was like Wow, but I was seeing the ball really well and all five pitches (the count went to 3 balls, 2 strikes) could have been strikes. Suddenly, everything became so clear it was spooky. It was like everything was in slow motion." Research has shown that enhancing flow can lead to increases in enjoyment in sport, which promotes higher levels of motivation, leading to more effort in practice and competition. Enhancing flow is also an important goal in sport because of its link with high performance. In this research we identify aspects of flow state that are likely to support basketball players' shooting performance. This involves watching videos of general basketball game competition from the US National Basketball Association (NBA) league.

What will I be asked to do?

As a participant in this study, you will first complete a questionnaire about your imagery, taking 15-20 minutes. Then you will complete a basketball-shooting task, shooting 2- and 3-point shots from various angles. You will have 10 practice shots and 80 trial shots. After that you will answer a questionnaire about your flow state while you were shooting. The basketball shooting will take 8-10 minutes and the flow questionnaire will take 10 minutes. Then you will watch six video sessions, three each week (Monday, Wednesday, Friday) over two weeks. On the first occasion, Phatsorn will guide you through the session, which lasts about 15 minutes. You are asked to tell us about your experience of imagery at the end of each session by writing comments in a diary. Then you will complete the basketball-shooting task again followed by the flow questionnaire. At the end of the study, Phatsorn will talk to you briefly about your experiences and performance during the study.

What will I gain from participating?

You are likely to gain greater understanding of flow experience, which should help you to achieve flow in basketball training and competition more often in future. The experience of flow should enhance your enjoyment of and motivation for basketball. You should also experience improved shooting performance that could transfer to your game performance in future.

How will the information I give be used?

1. The information form is used to collect details about your gender, age, basketball playing level, years or competition, and frequency of practice.
2. The imagery questionnaire is used to examine your use of imagery in basketball.
3. The basketball shooting performance task examines your shooting of 80 shots from 5 angles around the key at two distances.
4. The flow questionnaire asks you to describe your flow experience while doing basketball shooting.

The information gathered will be used in Phatsorn's PhD thesis. It will also be presented at conferences and published in academic journal articles. In all cases the information will be part of

group statistics, so your responses will not be identifiable at all. Presenting the findings of the study in these ways helps researchers, sport psychologists, coaches and athletes to learn more about flow, which can improve the experience of many athletes in future.

How will this project be conducted?

Following your consent to participate in this project, you will complete a short form giving information about yourself and then do a questionnaire on your imagery. After that you will perform the basketball-shooting task and report your flow during performance in a questionnaire. Then you will watch six video sessions and you will be given a different basketball shooting performance to watch in each session. Then you will do the shooting task again and describe your flow once more. Finally, you will discuss your experience with Phatsorn.

What are the potential risks of participating in this project?

This study has low risk to you because the shooting performance is similar to routine sport activities, so there is only minimal risk of physical harm, such as muscular soreness, as in normal training. You might be concerned about answering questions in the imagery and flow questionnaires, but these ask for your own personal experience, so there are no right or wrong answers, just what you think. Your own responses will be compared at the start and the end of the study and nobody else will see you perform or hear the results. The videos you will watch include experts performing basketball-shooting skills in matches, using good technique from which you can learn. All documentation will be given code numbers, so that you cannot be identified – your name will not be related with any information provided by you, and any personally identifying information, such as your signature on the consent form, will be stored separately from the data. To ensure confidentiality, you will be asked not to disclose names or other personally identifiable information about colleagues or coaches.

There are no right or wrong answers to the questionnaires, just your own opinions. If any questions are unclear please ask Phatsorn and she will help you. The basketball-shooting test is similar to drills you do in training and should not be as stressful as shooting in competition. Nonetheless, if you feel distressed with anything in the study you may take a break at any time. If your level of discomfort does not go away, you can withdraw with no reflection on you. If, at any stage during or after the study you wish to speak to somebody not involved in the research, you can also contact a psychologist, Dr Janet Young, Phone 99194762.

Who is conducting the study?

Any queries about your participation in this project may be directed to the Chief Investigator, Professor Tony Morris (Tel: 0430 511 543), the Co-investigator, Dr Anthony Watt (Tel: 0450955497) or the student investigator, Ms Phatsorn Waraphongthanachot (Tel: 0406 426 945).

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Appendix C

Consent Form for Study 1
CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS: Study 1 (Imagery condition)

We would like to invite you to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we focus on increasing your experience of things that help flow to happen. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. This involves imagining you know what you aim to achieve in shooting and having clear information about how well you are shooting. Thus, the aim in this research is to examine whether imagery of performing well to attain clear goals related to basketball shooting enhances your flow state and your shooting performance.

CERTIFICATION BY SUBJECT

I, of
certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study entitled: Enhancing Flow and Basketball Shooting Performance, being conducted at Victoria University by PhD student Phatsorn Waraphongthanachot under supervision by Professor Tony Morris and Dr Anthony Watt. I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the study, have been fully explained to me by Phatsorn Waraphongthanachot and that I freely consent to participation involving the use of these procedures.

Participation in this research involves:

- completing a questionnaire about your imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next you will do six imagery sessions using techniques related to flow and shooting
- then you will do the shooting task and flow questionnaire again
- finally, you will have a brief discussion with Phatsorn about your experience

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher (Name: Professor Tony Morris ph. O3-9919 5353 or 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*Please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Consent Form for Study 2

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS: Study 2 (Imagery condition)

We would like to invite you to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we focus on increasing your experience of things that help flow to happen. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. In this research we investigate the use of imagery to enhance aspects of flow state that are likely to support basketball players' shooting performance. This involves you imagining that you have a total focus on your basketball shooting.

CERTIFICATION BY SUBJECT

I, of

certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study entitled: Enhancing Flow and Basketball Shooting Performance, being conducted at Victoria University by PhD student Phatsorn Waraphongthanachot under supervision by Professor Tony Morris and Dr Anthony Watt. I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the study, have been fully explained to me by Phatsorn Waraphongthanachot and that I freely consent to participation involving the use of these procedures.

Participation in this research involves:

- completing a questionnaire about your imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next you will do six imagery sessions using techniques related to flow and shooting
- then you will do the shooting task and flow questionnaire again
- finally, you will have a brief discussion with Phatsorn about your experience

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher (Name: Professor Tony Morris ph. O3-9919 5353 or 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*Please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Consent Form for Study 3

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS: Study 3 (Imagery condition)

We would like to invite you to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we focus on increasing your experience of things that help flow to happen. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. In this research we investigate the use of imagery to enhance aspects of flow state that are likely to support basketball players' shooting performance. This involves imagining you are feeling calm and confident during basketball shooting performance.

CERTIFICATION BY SUBJECT

I, of

certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study entitled: Enhancing Flow and Basketball Shooting Performance, being conducted at Victoria University by PhD student Phatsorn Waraphongthanachot under supervision by Professor Tony Morris and Dr Anthony Watt. I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the study, have been fully explained to me by Phatsorn Waraphongthanachot and that I freely consent to participation involving the use of these procedures.

Participation in this research involves:

- completing a questionnaire about your imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next you will do six imagery sessions using techniques related to flow and shooting
- then you will do the shooting task and flow questionnaire again
- finally, you will have a brief discussion with Phatsorn about your experience

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher (Name: Professor Tony Morris ph. O3-9919 5353 or 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*Please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Consent Form for Study 1 – Control Condition

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS: Video condition

We would like to invite you to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we focus on increasing your experience of things that help flow to happen. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. In this research we identify aspects of flow state that are likely to support basketball players' shooting performance. This involves watching videos of basketball shooting by skilled performers.

CERTIFICATION BY SUBJECT

I, of

certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study entitled: Enhancing Flow and Basketball Shooting Performance, being conducted at Victoria University by PhD student Phatsorn Waraphongthanachot under supervision by Professor Tony Morris and Dr Anthony Watt. I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the study, have been fully explained to me by Phatsorn Waraphongthanachot and that I freely consent to participation involving the use of these procedures.

Participation in this research involves:

- completing a questionnaire about your imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next you will watch six video sessions of basketball shooting.
- then you will do the shooting task and flow questionnaire again
- finally, you will have a brief discussion with Phatsorn about your experience

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher (Name: Professor Tony Morris ph. O3-9919 5353 or 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*Please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Consent Form for Study 2 Control Condition

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS: Video condition

We would like to invite you to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we focus on increasing your experience of things that help flow to happen. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. In this research we identify aspects of flow state that are likely to support basketball players' shooting performance. This involves watching videos of basketball shooting by skilled performers.

CERTIFICATION BY SUBJECT

I, of

certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study entitled: Enhancing Flow and Basketball Shooting Performance, being conducted at Victoria University by PhD student Phatsorn Waraphongthanachot under supervision by Professor Tony Morris and Dr Anthony Watt. I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the study, have been fully explained to me by Phatsorn Waraphongthanachot and that I freely consent to participation involving the use of these procedures.

Participation in this research involves:

- completing a questionnaire about your imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next you will watch six video sessions of general basketball game competition.
- then you will do the shooting task and flow questionnaire again
- finally, you will have a brief discussion with Phatsorn about your experience

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher (Name: Professor Tony Morris ph. O3-9919 5353 or 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*Please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Consent Form for Study 3 – Control Condition

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS: Video condition

We would like to invite you to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we focus on increasing your experience of things that help flow to happen. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. In this research we identify aspects of flow state that are likely to support basketball players' shooting performance. This involves watching videos of basketball shooting by skilled performers.

CERTIFICATION BY SUBJECT

I, of

certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study entitled: Enhancing Flow and Basketball Shooting Performance, being conducted at Victoria University by PhD student Phatsorn Waraphongthanachot under supervision by Professor Tony Morris and Dr Anthony Watt. I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the study, have been fully explained to me by Phatsorn Waraphongthanachot and that I freely consent to participation involving the use of these procedures.

Participation in this research involves:

- completing a questionnaire about your imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next you will watch six video sessions of general basketball game competition.
- then you will do the shooting task and flow questionnaire again
- finally, you will have a brief discussion with Phatsorn about your experience

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher (Name: Professor Tony Morris ph. O3-9919 5353 or 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*Please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Appendix D

Demographic Form

Demographic Questions:

1. Today's Date: ___ ___ / ___ ___ / ___ ___ ___ ___
day month year

2. Gender:
○ Male ○ Female

3. Age ____________________Years

4. What is your current level of basketball competition?

○ Domestic Basketball Competitions (local basketball around the state)
○Division A ○Division B ○Division C
○ Representative Competitions (players selected by associations)
○ National Leagues (Elite players)
○ International Tournaments (At the highest level, Australian national teams compete in World Championships, Olympic Games and other international events).
○ Other (specify) ____

5. How long have you experience competition in basketball player? __________Years

6. How many times per week are you involved in basketball competition? ____Times

7. How many hours per week are you involved in basketball training? ________Hours

Appendix E

Sport Imagery Ability Measure (SIAM)

Code:____________________

Date:____________________

Sport Imagery Activities Form

Introduction

This questionnaire involves creating images of four situations in sport. After you image each scene, you will rate the imagery on twelve scales. For each rating, place a cross on the line at the point you feel best represents the image you produced. The left end of the line represents no image or sensation or feeling at all and the right end represents a very clear or strong image or feeling or sensation.
Ensure the ***intersection*** of the cross is on the line as shown in the examples below.

Correct X

Incorrect x x

An **example** of the style of scene to be created is as follows:

You are at a carnival, holding a bright yellow, brand new tennis ball in your right hand. You are about to throw it at a pyramid of six blue and red painted cans. A hit will send the cans flying and win you a prize. You grip the ball with both hands to help release the tension, raise the ball to your lips and kiss it for luck, noticing its soft new wool texture and rubber smell. You loosen your throwing arm with a shake and, with one more look at the cans, you throw the ball. Down they all go with a loud "crash" and you feel great.

Below are some possible ratings and what they represent to give you the idea.

1. How **clear** was the image ?

no image X perfectly clear image

This example shows an image was experienced but was quite unclear

6. How well did you **feel the muscular movements** within the image?

no feeling X very strong feeling

This example indicates very strong imagery of the feel of muscular movements

7. How well did you **hear** the image?

no hearing X very clear hearing

This example reflects the strongest possible image, like hearing the real sound

12. How strong was your **experience of the emotions** generated by the image?

no emotion X very strong emotion

This example reflects a degree of emotion which is moderate

Do you have any questions regarding the imagery activity or the way you should respond using the rating scales? Please feel free to ask now.

DO NOT TURN THE PAGE UNTIL YOU ARE ASKED TO DO SO.

Please complete the following practice question. Listen carefully to all the instructions. Note that this question does not count. It is here to help you get used to imaging and rating your experience

Fitness Activity

Imagine yourself doing an activity to improve your fitness for your sport. Get a clear picture of what you are doing, where you are, and who you are with. Take notice of what you can see around you, the sounds you hear, and the feel of any muscles moving. Do you get the sensation of any smells or tastes? Can you feel the equipment and surfaces you are using? Do you get an emotional feeling from this activity? Now you have 60 seconds to create and experience your image of the scene. When the 60 seconds is up, complete **all** 12 scales below. Don't spend too much time on each; your first reaction is best. Remember to place a cross with its **intersection** on the line.

1. How well did you get the sensation of **taste** within the image?

no taste ________________________________ very clear taste

2. How **long** was the image held?

image held for a very short time ________________________________ image held for the whole time

3. How well did you **feel the texture** of objects within the image?

no feeling ________________________________ very clear feeling

4. How **clear** was the image?

no image ________________________________ perfectly clear

5. How well did you **hear** the image?

no hearing ________________________________ very clear hearing

6. How **easily** was an image created?

image difficult to create ________________________________ image easy to create

7. How well did you **see** the image?

no seeing ________________________________ very clear seeing

8. How **quickly** was an image created?

image slow to create ________________________________ image created quickly

9. How strong was your **experience of the emotions** generated by the image?

no emotion ________________________________ very strong emotion

10. How well did you **feel** the muscular movements within the image?

no feeling ________________________________ very strong feeling

11. How well could you **control** the image?

unable to control image ________________________________ completely able to control image

12. How well did you get the sensation of **smell** within the image?

no smell ________________________________ very clear smell

Check that you have placed a cross on all 12 lines.

DO NOT TURN OVER UNTIL YOU ARE ASKED TO DO SO.

Your "Home" Venue

Imagine that you have just got changed and made your final preparations for a competition at your "home" venue, where you usually practice and compete. You move out into the playing area and loosen up while you look around and tune in to the familiar place. Take notice of what you can see around you, the sounds you hear, and the feel of any muscles moving. Do you get the sensation of any smells or tastes? Can you feel the equipment and surfaces you are using? Do you get an emotional feeling from this activity? Now you have 60 seconds to create and experience your image of the scene. When the 60 seconds is up, complete **all** 12 scales below. Don't spend too much time on each; your first reaction is best. Remember to place a cross with its **intersection** on the line.

1. How well did you **feel the texture** of objects within the image?

no feeling ______________________________ very clear feeling

2. How **clear** was the image?

no image ______________________________ perfectly clear

3. How well did you get the sensation of **taste** within the image?

no taste ______________________________ very clear taste

4. How **long** was the image held?

image held for a very short time ______________________________ image held for the whole time

5. How well did you **hear** the image?

no hearing ______________________________ very clear hearing

6. How **easily** was an image created?

image difficult to create ______________________________ image easy to create

7. How strong was your **experience of the emotions** generated by the image?

no emotion ______________________________ very strong emotion

8. How well did you **see** the image?

no seeing ______________________________ very clear seeing

9. How well did you **feel** the muscular movements within the image?

no feeling ______________________________ very strong feeling

10. How well could you **control** the image?

unable to control image ______________________________ completely able to control image

11. How well did you get the sensation of **smell** within the image?

no smell ______________________________ very clear smell

12. How **quickly** was an image created?

image slow to create ______________________________ image created quickly

Check that you have placed a cross on all 12 lines.

DO NOT TURN OVER UNTIL YOU ARE ASKED TO DO SO.

Successful Competition
Imagine you are competing in a specific event or match for your sport. Imagine that you are at the very end of the competition and the result is going to be close. You pull out a sensational move, shot, or effort to win the competition. Take notice of what you can see around you, the sounds you hear, and the feel of any muscles moving. Do you get the sensation of any smells or tastes? Can you feel the equipment and surfaces you are using? Do you get an emotional feeling from this activity? Now you have 60 seconds to create and experience your image of the scene. When the 60 seconds is up, complete **all** 12 scales below. Don't spend too much time on each; your first reaction is best. Remember to place a cross with its **intersection** on the line.

1. How well did you **see** the image?

no seeing |______________________________| very clear seeing

2. How **quickly** was an image created?

image slow to create |______________________________| image created quickly

3. How strong was your **experience of the emotions** generated by the image?

no emotion |______________________________| very strong emotion

4. How **clear** was the image?

no image |______________________________| perfectly clear

5. How well did you get the sensation of **taste** within the image?

no taste |______________________________| very clear taste

6. How well could you **control** the image?

unable to control image |______________________________| completely able to control image

7. How well did you get the sensation of **smell** within the image?

no smell |______________________________| very clear smell

8. How **easily** was an image created?

image difficult to create |______________________________| image easy to create

9. How well did you **feel the texture** of objects within the image?

no feeling |______________________________| very clear feeling

10. How **long** was the image held?

image held for a very short time |______________________________| image held for the whole time

11. How well did you **feel** the muscular movements within the image?

no feeling |______________________________| very strong feeling

12. How well did you **hear** the image?

no hearing |______________________________| very clear hearing

Check that you have placed a cross on all 12 lines.
DO NOT TURN OVER UNTIL YOU ARE ASKED TO DO SO.

A Slow Start

Imagine that the competition has been under way for a few minutes. You are having difficulty concentrating and have made some errors. You want to get back on track before it shows on the scoreboard. During a break in play, you take several deep breaths and really focus on a spot just in front of you. Now you switch back to the game much more alert and tuned in. Take notice of what you can see around you, the sounds you hear, and the feel of any muscles moving. Do you get the sensation of any smells or tastes? Can you feel the equipment and surfaces you are using? Do you get an emotional feeling from this activity? Now you have 60 seconds to create and experience your image of the scene. When the 60 seconds is up, complete **all** 12 scales below. Don't spend too much time on each; your first reaction is best. Remember to place a cross with its **intersection** on the line.

1. How strong was your **experience of the emotions** generated by the image?

no emotion ______________________________ very strong emotion

2. How **easily** was an image created?

image difficult to create ______________________________ image easy to create

3. How well did you **feel the texture** of objects within the image?

no feeling ______________________________ very clear feeling

4. How well could you **control** the image?

unable to control image ______________________________ completely able to control image

5. How well did you get the sensation of **smell** within the image?

no smell ______________________________ very clear smell

6. How **clear** was the image?

no image ______________________________ perfectly clear

7. How well did you **hear** the image?

no hearing ______________________________ very clear hearing

8. How **quickly** was an image created?

image slow to create ______________________________ image created quickly

9. How well did you get the sensation of **taste** within the image?

no taste ______________________________ very clear taste

10. How **long** was the image held?

image held for a very short time ______________________________ image held for the whole time

11. How well did you **see** the image?

no seeing ______________________________ very clear seeing

12. How well did you **feel** the muscular movements within the image?

no feeling ______________________________ very strong feeling

Check that you have placed a cross on all 12 lines.

DO NOT TURN OVER UNTIL YOU ARE ASKED TO DO SO.

Training Session

Think of a drill you do in training that is really tough. Now imagine yourself doing the drill. As you get a picture of yourself performing the skill in practice, try to complete an entire routine or drill. Take notice of what you can see around you, the sounds you hear, and the feel of any muscles moving. Do you get the sensation of any smells or tastes? Can you feel the equipment and surfaces you are using? Do you get an emotional feeling from this activity? Now you have 60 seconds to create and experience your image of the scene. When the 60 seconds is up, complete **all** 12 scales below. Don't spend too much time on each; your first reaction is best. Remember to place a cross with its **intersection** on the line.

1. How well did you **feel** the muscular movements within the image?

no feeling ——————————————— very strong feeling

2. How well could you **control** the image?

unable to control image ——————————————— completely able to control image

3. How well did you **hear** the image?

no hearing ——————————————— very clear hearing

4. How **long** was the image held?

image held for a very short time ——————————————— image held for the whole time

5. How well did you get the sensation of **taste** within the image?

no taste ——————————————— very clear taste

6. How well did you **see** the image?

no seeing ——————————————— very clear seeing

7. How **easily** was an image created?

image difficult to create ——————————————— image easy to create

8. How strong was your **experience of the emotions** generated by the image?

no emotion ——————————————— very strong emotion

9. How **quickly** was an image created?

image slow to create ——————————————— image created quickly

10. How well did you get the sensation of **smell** within the image?

no smell ——————————————— very clear smell

11. How **clear** was the image?

no image ——————————————— perfectly clear

12. How well did you **feel the texture** of objects within the image?

no feeling ——————————————— very clear feeling

Check that you have placed a cross on all 12 lines.

DO NOT TURN OVER UNTIL YOU ARE ASKED TO DO SO.

Appendix F

Flow State Scale-2 (FSS-2)

Study 1, 2, & 3 - Flow State Questionnaire

Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002)
Please answer the following questions in relation to your experience in the event you have just completed. These questions relate to the thoughts and feelings you may have experienced during the event. There are no right or wrong answers. Think about how you felt during the event and answer the questions using the rating scale below. Circle the number that best matches your experience from the options under each question.

Rating scale:

Strongly Disagree 1	Disagree 2	Neither agree disagree 3	Agree 4	Strongly agree 5

During the event __________________________

1. I was challenged, but I believed my skills would allow me to meet the challenge.

1 2 3 4 5

2. I made the correct movements without thinking about trying to do so.

1 2 3 4 5

3. I knew clearly what I wanted to do.

1 2 3 4 5

4. It was really clear to me how my performance was going.

1 2 3 4 5

5. My attention was focused entirely on what I was doing.

1 2 3 4 5

6. I had a sense of control over what I was doing.

1 2 3 4 5

7. I was not concerned with what others may have been thinking of me.

1 2 3 4 5

8. Time seemed to alter (either slowed down or speeded up).

1 2 3 4 5

Rating scale:

Strongly Disagree 1	Disagree 2	Neither agree disagree 3	Agree 4	Strongly agree 5

9. I really enjoyed the experience.

1 2 3 4 5

10. My abilities matched the high challenge of the situation.

1 2 3 4 5

11. Things just seemed to be happening automatically.

1 2 3 4 5

12. I had a strong sense of what I wanted to do.

1 2 3 4 5

13. I was aware of how well I was performing.

1 2 3 4 5

14. It was no effort to keep my mind on what was happening.

1 2 3 4 5

15. I felt like I could control what I was doing.

1 2 3 4 5

16. I was not concerned with how others may have been evaluating me.

1 2 3 4 5

17. The way time passed seemed to be different from normal.

1 2 3 4 5

18. I loved the feeling of that performance and want to capture it again.

1 2 3 4 5

19. I felt I was competent enough to meet the high demands of the situation.

1 2 3 4 5

Rating scale:

Strongly Disagree 1	Disagree 2	Neither agree disagree 3	Agree 4	Strongly agree 5

20. I performed automatically, without thinking too much.

1 2 3 4 5

21. I knew what I wanted to achieve.

1 2 3 4 5

22. I had a good idea while I was performing about how well I was doing

1 2 3 4 5

23. I had total concentration.

1 2 3 4 5

24. I had a feeling of total control.

1 2 3 4 5

25. I was not concerned with how I was presenting myself.

1 2 3 4 5

26. It felt like time went by quickly.

1 2 3 4 5

27. The experience left me feeling great.

1 2 3 4 5

28. The challenge and my skills were at an equally high level.

1 2 3 4 5

29. I did things spontaneously and automatically without having to think.

1 2 3 4 5

30. My goals were clearly defined.

1 2 3 4 5

Rating scale:

Strongly Disagree 1	Disagree 2	Neither agree disagree 3	Agree 4	Strongly agree 5

31. I could tell by the way I was performing how well I was doing.

1 2 3 4 5

32. I was completely focused on the task at hand.

1 2 3 4 5

33. I felt in total control of my body.

1 2 3 4 5

34. I was not worried about what others may have been thinking of me.

1 2 3 4 5

35. I lost my normal awareness of time.

1 2 3 4 5

36. I found the experience extremely rewarding.

1 2 3 4 5

Appendix G

Flow Imagery Script

Flow Imagery Script for Participants in Study 1 (Goal Setting)

Imagery Scripts to Enhance Flow Antecedents to Promote Flow and Increase Performance

This imagery instruction script is an improvement tool for flow. Flow is a positive and peak experience, related to total concentration, calmness, and confidence. Using best practice of imagery design to guide development of the imagery script, the script is devised for the selected flow dimension (goals/feedback/challenge-skill balance in Study 1) based on characteristics of that dimension. Participants complete six imagery-training sessions in their own time, each lasting 15 minutes over two weeks, imagining shooting 2- and 3-point shots from each distance and angle used in the performance test. The imagery will be conducted on Monday, Wednesday and Friday of each week. Participants will complete a logbook to indicate the dates and times when they completed the sessions and any comments on their experiences during the sessions. The perform33ance and flow post-test will follow the final imagery session on the second Friday. The key aspects of the script in Study 1 are:

Study 1 (Goal Setting) Setting appropriate goals is the key to Study 1. The goal should be specific, challenging, but achievable, it should match participants' skill level, so challenge-skill balance is attained, and it should lead to unambiguous feedback. For these purposes, the scoring system for performance is too complex, so each individual participant's goals will set in terms of number of baskets attained out of 80 trials. This goal will comprise a challenging number of successful shots related to that participant's skill level, which will be based on their performance in the 80-shot basketball-shooting pre-test and discussion with the participant. Then imagery is based on a script that describes the task as challenging, but states that participants' skills match the challenge, as they perform successful shooting of baskets with clear feedback of the shots going through the basketball ring cleanly and the final score reaching the desired goal. In Study 1, each participant in the imagery condition will be given individual goals in terms of the accuracy of their shooting to ensure that the challenge for that individual matches their skill level.

Following is an example of the first part of the imagery script for Study 1, involving challenge skill balance, clear goals, and unambiguous feedback.

In this session you will be guided to relax because relaxation helps people to produce effective imagery. Then you will imagine that you are standing at one end of your usual training court and that you are going to shoot baskets with the goal of shooting at least the number of baskets out of 80 trials that we agreed in our goal-setting discussion. This was a challenging goal, but you know you have the skill to achieve this goal. In the imagery session you won't imagine doing 80 trials because that would be rather long for you to stay focused on the imagery. Also, because it is not good to imagine negative outcomes, you will imagine every shot during the imagery being successful. Then we will move the imagery to the last few shots out of 80 that need to be successful for you to achieve your goal. Again, you will imagine each shot going through the ring and you achieving your goal and feeling good about your performance. (*This introduction is only presented on the first occasion.*)
Is everything clear? Do you have any questions? (*After answering any questions the imagery part of the script starts.*)

Sit in a comfortable position. You can close your eyes or have them open, whichever works best for you to have vivid imagery. Now take a deep abdominal breath in through your nose. Inhale right down to your navel. Breath in….in….in…..and hold (3 secs)….now slowly breath out through your mouth and out…..and out. Feel yourself relaxing. Feel the tension leaving your body. Now once more breath in ….and in ….and in. Hold (3 secs). Now breath out ….and out ….and out. Feel the relaxation increasing. Nice and relaxed now. Ready to imagine the basketball-shooting scene..….

Now imagine you are standing at one end of the basketball court where you usually train. Look around you at all the familiar sights. How big is the sports hall? How many courts are there? Are people playing basketball and other sports in other areas? What is the colour of the court floor and the court markings? What is the colour of the ring at your end and the net that hangs below it? What sounds can you hear? Is there a recognizable aroma you can smell? You are wearing your usual training kit. How does it feel? Are your clothes and shoes comfortable? You are holding a basketball. Feel the texture of the surface by moving your fingers a little. Is the ball nice and firm, so it will bounce well. Try it. Bounce the ball and catch it again a few times. Feel how the ball springs back up against and follow through.

Now look at the court around the ring at your end. Notice that there are pieces of blue tape in the shape of crosses at the same ten positions where they were placed during the shooting task you did a little while ago. This is your shooting task for this session. You must shoot [this is the individual's goal number of successful shots] baskets out of 80 shots to meet your goal. You can keep score easily because it is clear whenever the ball goes through the ring and you add one to your score. Walk to cross 2-point A. You can bounce the ball with one hand as you walk. Catch the ball as you reach the blue cross. Stand on the cross facing the basketball ring. Take a breath, feel the ball in your hands and go through your usual shooting preparation for a 2-point jump shot. Focus on the ring, jump and shoot. Watch the ball arc up and then drop down cleanly through the ring. One out of one. Collect the ball and go back to the same blue cross. Shoot again….Same result, a clean basket. Two out of two. You are starting to feel that you are in a rhythm. Collect the ball and shoot again. Three out of three. Once again grab the ball go back to cross 2-point A, face the ring and perform your rhythmical jump shot. A fourth clean basket…..

You have now performed 72 shots, eight each from the five 2-point shooting positions (blue crosses) and eight from four of the five 3-point shooting positions. You have been keeping score, which is easy because you can always see clearly whether the ball goes through the basketball ring or not and you add one point to your score each time the shot is successful. Your score is [depends on each individual's goal. The score is goal from 80 shots minus 8.] Now you move to the final 3-point shooting position. You know you must successfully score with all the final 8 shots. It is a challenging task, but you feel confident you have the skill to meet the challenge and reach your goal. Stand on the cross facing the basketball ring. Take a breath, feel the ball in your hands and go through your usual shooting preparation for a 3-point jump shot. Focus on the ring, jump and shoot. Watch the ball arc up and then drop down cleanly through the ring. Collect the ball and go back to the same blue cross. Shoot again….Same result, a clean basket. You are starting to feel that you are in a rhythm again. Collect the ball and shoot again. Three out of three. Once again grab the ball go back to cross 3-point E, face the ring and perform your rhythmical jump shot. A fourth clean basket. Now you are starting to feel a mixture of excitement and arousal. Only four shots left. Four more successful shots and you'll meet your challenging goal. You know you have the skill; you just need to maintain your focus and rhythm. Prepare for shot 5 from cross 3-point E. Focus on the ring, jump and shoot. Yes. Success again. You grab the bouncing ball and rush back to the cross, then realize you need to maintain your rhythm, so you take a deep breath and then prepare for shot 6 jump and shoot. It's through the ring. Just two more shots. You understand that it is crucial to maintain your rhythm and relax, so you walk a little more slowly to retrieve the ball, return to the cross….prepare….jump….shoot….another clean basket. You feel your heart skip a beat. One more good shot. You stand on the cross, feel the ball against your fingers, focus on the ring, jump and shoot once more. It's a swish….clean through the ring. Now you can celebrate. You met the challenge you set yourself. Your skill is all you believed it to be. You feel really good as you grab the ball, hug it and look one more time at the basketball ring, just to say to yourself you did a great job.

Now listen to me. I am going to count to five. As I do you will start to become aware of your surroundings and be fully conscious. One, starting to be aware of your location. Two, feeling the muscles in your arms and legs starting to tingle with activity. Three, becoming more aware of the real surroundings. Four, flexing arms and legs and stretching. Opening your eyes if you had them closed. Five, wide awake and feeling really refreshed. Remembering how well you did in the imagery task and feeling really good about your basketball 2-point and 3-point shooting. You know that you have the skill to meet the challenge of a really tough basketball-shooting task. You were able to meet your goal and that makes you happy.

Flow Imagery Script

Flow Imagery Script for Participants in Study 2 (Concentration)

Imagery Scripts to Enhance Flow Antecedents to Promote Flow and Increase Performance

This imagery instruction script is an improvement tool for flow. Flow is a positive and peak experience, related to total concentration, calmness, and confidence. Using best practice of imagery design to guide development of the imagery script, the script is devised for the selected flow dimension (Total Concentration in Study 2) based on characteristics of that dimension. Participants complete six imagery-training sessions in their own time, each lasting 15 minutes over two weeks, imagining shooting 2- and 3-point shots from each distance and angle used in the performance test. The imagery will be conducted on Monday, Wednesday and Friday of each week. Participants will complete a logbook to indicate the dates and times when they completed the sessions and any comments on their experiences during the sessions. The performance and flow post-test will follow the final imagery session on the second Friday. The key aspects of the script in Study 2 are:

Study 2 (concentration) The script for enhancing total concentration describes imagery in which participants are totally focused on shooting basketballs. Because participants are competitive players with at least moderate skill levels, they are instructed to focus on their usual routine for shooting baskets. They are not directed to focus on skill production because, at their skill level, the shooting skill should be automatic and focusing on the skill leads them to switch to controlled processing with an accompanying decrement in performance (e.g., Mesagno, Marchant, & Morris, 2009). Thus, for example, in this study participants are likely to focus on the feel of the ball, the location of the basket, and their readiness to shoot. Then they focus on the shot, the ball travelling to the basket, and the successful outcome of the shot. An example of the material in the first part of the actual imagery script for Study 2 follows. Study 2 involves total concentration. To do the task appropriately, participants need to have clear goals, and get unambiguous feedback about their basketball shooting performance during imagery. It is also important to match their ability to the challenge of the task. Then, to attain flow, it is important for them to achieve total concentration on the task. Here is some of the actual script:

In this session you will be guided to relax because relaxation helps people to produce effective imagery. Then you will imagine that you are standing at one end of your usual training court and that you are going to shoot baskets with the concentration at least the number of baskets out of 80 trials that we agreed in our focus discussion. This was a challenging goal, but you know you have the skill to achieve this goal. In the imagery session you won't imagine doing 80 trials because that would be rather long for you to stay focused on the imagery. Also, because it is not good to imagine negative outcomes, you will imagine every shot during the imagery being successful. Then we will move the imagery to the last few shots out of 80 that need to be successful for you to achieve your goal. Again, you will imagine each shot going through the ring and you achieving your goal and feeling good about your performance. (*This introduction is only presented on the first occasion.*)
Is everything clear? Do you have any questions? (*After answering any questions the imagery part of the script starts.*)

Sit in a comfortable position. You can close your eyes or have them open, whichever works best for you to have vivid imagery. Now take a deep abdominal breath in through your nose. Inhale right down to your navel. Breath in….in….in…..and hold (3 secs)….now slowly breath out through your mouth and out…..and out. Feel yourself relaxing. Feel the tension leaving your body. Now once more, breath in ….and in ….and in. Hold (3 secs). Now breath out ….and out ….and out. Feel the relaxation increasing. Nice and relaxed now. Ready to imagine the basketball shooting scene..….

Now imagine you are standing at one end of the basketball court where you usually train. Look around you at all the familiar sights. How big is the sports hall? How big is the ball in men's/women's (*use the term that fits the gender of the participant*) basketball? How many courts are there? Are people playing basketball and other sports in other areas? What is the colour of the court floor and the court markings? What is the colour of the ring at your end and the net that hangs below it? What sounds can you hear? Is there a recognizable aroma you can smell? You are wearing your usual training kit. How does it feel? Are your clothes and shoes comfortable? You are holding a basketball. What is the colour of the ball that you are holding? Feel the texture of the surface by moving your fingers a little. Is the ball nice and firm, so it will bounce well. Try it. Bounce the ball and catch it again a few times. Feel how the ball springs back up against and follow through.

Now look at the court around the ring at your end. Notice that there are pieces of blue tape in the shape of crosses at the same ten positions where they were placed during the shooting task you did a little while ago. This is your shooting task for this session. You must focus on the feeling of the ball, the location of the basket, and your successful outcome of the shot.

Walk to cross 2-point A. You pay attention to bounce the ball with one hand as you walk. Catch the ball as you reach the blue cross. Stand on the cross facing the basketball ring. Take a breath and feel how this helps you to focus your attention on the task of 2-point shooting. Feel the ball in your hands and go through your usual shooting preparation for a 2-point jump shot. Focus on the ring, jump and shoot. Watch the ball arc up and then drop down cleanly through the ring. One out of one. That is exactly how you want to perform every shot, so maintain your concentration on the 2-point shooting task. Collect the ball and go back to the same blue cross. Shoot again….Same result, a clean basket. Two out of two. You are starting to feel that you are in a rhythm and you are concentrating totally on the shooting task. Nothing else matters, Just shooting the next basket. Collect the ball and shoot again. Three out of three. Once again grab the ball go back to cross 2-point A, face the ring and perform your rhythmical jump shot. A fourth clean basket…..and great concentration on the 2-point shooting task.

You have now performed 72 shots, eight each from the five 2-point shooting positions (blue crosses), then you adjusted your concentration to focus on the 3-point shooting task and shot eight shots from four of the five 3-point shooting positions. You have been keeping score, which is easy because you can always see clearly whether the ball goes through the basketball ring or not and you add one point to your score each time the shot is successful. You are focusing your attention on the 3-point shooting skill, not pay attention to anything else. Now you move to the final 3-point shooting position at blue cross 3-point E. You know you must successfully score with all the final 8 shots. It is a challenging task, but you feel confident. Stand on the cross facing the basketball ring. Take a breath, feel the ball in your hands and go through your usual shooting preparation for a 3-point jump shot. Focus on the ring, jump and shoot. Watch the ball arc up and then drop down cleanly through the ring. Collect the ball and go back to the same blue cross. Shoot again….Same result, a clean basket. You are starting to feel that you are in a rhythm again. Your concentration is locked onto the task of shooting from 3-point E. Collect the ball and shoot again. Three out of three. Once again grab the ball go back to cross 3-point E, face the ring and perform your rhythmical jump shot. A fourth clean basket. Now you are starting to feel a mixture of excitement and arousal. Only four shots left. You know you have the skill; you just need to maintain your focus and rhythm. Prepare for shot 5 from cross 3-point E. Focus on the ring, jump and shoot. Yes! Success again. You grab the bouncing ball and rush back to the cross, then realize you need to maintain your rhythm and focus, so you take a deep breath and then prepare for shot 6, jump and shoot. It's through the ring. Just two more shots. You understand that it is crucial to maintain your rhythm and relax, so you walk a little more slowly to retrieve the ball, maintaining that total focus on 3-point shooting from this position. You return to the cross….prepare….jump…. shoot…. another clean basket. You feel your heart skip a beat. One more good shot. You stand on the cross, feel the ball against your fingers, focus on the ring, jump and shoot once more. It's a swish….clean through the ring. Now you can celebrate. You met the challenge you set yourself. Your skill is all you believed it to be. You reflect on the way you were able to lock in your concentration for a large part of the shooting task. Concentrating totally for 80 shots is a big challenge, but you know that you can focus for long periods and you are sure that when you do have that total focus you can't miss. You feel really good as you grab the ball, hug it and look one more time at the basketball ring, just to say to yourself you did a great job.

Now listen to me. I am going to count to five. As I do you will start to become aware of your surroundings and be fully conscious. One, starting to be aware of your location. Two, feeling the muscles in your arms and legs starting to tingle with activity. Three, becoming more aware of the real surroundings. Four, flexing arms and legs and stretching. Opening your eyes if you had them closed. Five, wide awake and feeling really refreshed. Remembering how well you did in the imagery task, particularly how you were able to maintain total concentration on the task, and feeling really good about your basketball 2-point and 3-point shooting.

Flow Imagery Script

Flow Imagery Script for Participants in Study 3 (Sense of Control)

Imagery Scripts to Enhance Flow Antecedents to Promote Flow and Increase Performance

This imagery instruction script is an improvement tool for flow. Flow is a positive and peak experience, related to total concentration, calmness, and confidence. Using best practice of imagery design to guide development of the imagery script, the script is devised for the selected dimension (Sense of Control in Study 3) based on characteristics of that dimension. Participants complete six imagery-training sessions in their own time, each lasting 15 minutes over two weeks, imagining shooting 2- and 3-point shots from each distance and angle used in the performance test. The imagery will be conducted on Monday, Wednesday and Friday of each week. Participants will complete a logbook to indicate the dates and times when they completed the sessions and any comments on their experiences during the sessions. The performance and flow post-test will follow the final imagery session on the second Friday. The key aspects of the script in study are:

Study 3 (Sense of Control) Sense of control is about feeling calm (relaxed yet alert) and confident. Thus, the imagery script focuses on sensations associated with feeling relaxed, but focused on the task. In addition, the script promotes feelings of confidence, reinforced by successful shooting as the session continues, thus, enhancing confidence over the course of a session and from session to session. For example, in this study participants might have more of an emphasis on a simple feeling of confidence. Then they feel in control and think about experiencing a positive attitude or confidence like they really believe they can achieve the goal that they have set for the imagery task.

Following is an example of the first part of the imagery script for Study 3, involving sense of control.

In this session you will be guided to relax because relaxation helps people to produce effective imagery. Then you will imagine that you are standing at one end of your usual training court and that you are going to shoot baskets from 2-point and 3-point positions. You will imagine feeling relaxed, yet alert, so you feel calm about performing the task. In addition, you will imagine feeling really confident about achieving the goal you have set. [*Insert here the goal number of successful shots*] is a challenging score out of 80, but you believe you can achieve that number of baskets. After imagining the first few shots of the task, we will move the imagery to the last few shots out of 80 that need to be successful in achieving your goal. Again, you will imagine each shot going through the ring, while you feel calm and confident. (*This introduction is only presented on the first occasion.*) Is everything clear? Do you have any questions? (*After answering any questions the imagery part of the script starts.*)

Sit in a comfortable position. You can close your eyes or have them open, whichever works best for you to have vivid imagery. Now take a deep abdominal breath in through your nose. Inhale right down to your navel. Breath in….in….in…..and hold (3 secs)….now slowly breath out through your mouth and out…..and out. Feel yourself relaxing. Feel the tension leaving your body. Now once more breath in ….and in ….and in. Hold (3 secs). Now breath out ….and out ….and out. Feel the relaxation increasing. Nice and relaxed now. Ready to imagine the basketball shooting scene..….

Now imagine you are standing at one end of the basketball court where you usually train. Look around you at all the familiar sights. How big is the sports hall? How many courts are there? Are people playing basketball and other sports in other areas? What is the colour of the court floor and the court markings? What is the colour of the ring at your end and the net that hangs below it? What sounds can you hear? Is there a recognizable aroma you can smell? You are wearing your usual training kit. How does it feel? Are your clothes and shoes comfortable? Make sure they feel good, so they won't distract you. You are holding a basketball. Feel the texture of the surface by moving your fingers a little. Is the ball nice and firm, so it will bounce well. Try it. Bounce the ball and catch it again a few times. Feel how the ball springs back up against and follow through. OK, now you are feeling good, relaxed and calm, confident and ready to perform the basketball-shooting task.

Now look at the court around the ring at your end. Notice that there are pieces of blue tape in the shape of crosses at the same ten positions where they were placed during the shooting task you did a little while ago. This is your shooting task for this session. You are going to shoot 2-point and 3-point baskets from around the ring. You feel relaxed and confident about doing this task well enough to achieve the challenging goal you have set yourself. Thus, the imagery will focuses on sensations associated with a sense of control, that is, you feel calm and confident about doing the task. In addition, your confidence will be enhanced over the course of the session and from session to session because the script promotes feelings of confidence, reinforced by successful shooting as the session continues.

Walk to cross 2-point A. You should feel in control on every action…feel calm and confident…in control. You can bounce the ball with one hand as you walk. Catch the ball as you reach the blue cross. Stand on the cross facing the basketball ring. Take a breath, feel the ball in your hands and go through your usual shooting preparation for a 2-point jump shot. Focus on the ring, jump and shoot. Watch the ball arc up and then drop down cleanly through the ring. One out of one. Collect the ball and go back to the same blue cross. Shoot again….Same result, a clean basket. Two out of two. You are starting to feel that you are in a rhythm and the feeling of calmness and confidence in your shooting remains strong. Collect the ball and shoot again. Three out of three. Once again grab the ball go back to cross 2-point A, face the ring and perform your rhythmical jump shot. A fourth clean basket…..

You have now performed 72 shots, eight each from the five 2-point shooting positions (blue crosses) and eight from four of the five 3-point shooting positions. You have scored [*insert goal score minus 8 points*], so you need all 8 baskets from the final shooting position. Stand on the blue cross 3-point E, facing the basketball ring. Take a breath and refocus. Once again you feel relaxed, calm and confident that you can make the last 8 shots. Feel the ball in your hands and go through your usual shooting preparation for a 3-point jump shot. Focus on the ring, jump and shoot. Watch the ball arc up and then drop down cleanly through the ring. Collect the ball and go back to the same blue cross. Shoot again….Same result, a clean basket. You are starting to feel that you are in a rhythm again. This is a challenging end to the task, but you are confident that you can shoot six more 3-pointers to meet your goal. That confidence helps you to remain calm and in control. Collect the ball and shoot again. Three out of three. Once again grab the ball, go back to cross 3-point E, face the ring and perform your rhythmical jump shot. A fourth clean basket. Now you are starting to feel a mixture of excitement and arousal. Only four shots left. You know you have the skill; you just need to maintain your focus and rhythm. Prepare for shot 5 from cross 3-point E. Focus on the ring, jump and shoot. Yes. Success again. You grab the bouncing ball and rush back to the cross, then realize you need to maintain your rhythm, so you take a deep breath, feel that sense of calmness that is associated with successful performance and your confidence remains strong. Then prepare for shot 6, jump and shoot. It's through the ring. Just two more shots. You understand that it is crucial to maintain your rhythm and relax, so you walk a little more slowly to retrieve the ball, allowing the sense of control, feeling calm and confident to shoot again. Return to the cross….prepare….jump….shoot….another clean basket. You feel your heart skip a beat. One more good shot. You stand on the cross, feel the ball against your fingers, focus on the ring, jump and shoot once more. It's a swish….clean through the ring. Now you can celebrate. You met the challenge you set yourself. Your skill is all you believed it to be. That feeling of calmness and confidence played a valuable part. You remember what it felt like to be calm and confident at that real crunch time in your performance. You aim to keep that memory and use it in future. You feel really good as you grab the ball, hug it and look one more time at the basketball ring, just to say to yourself you did a great job.

Now listen to me. I am going to count to five. As I do you will start to become aware of your surroundings and be fully conscious. One, starting to be aware of your location. Two, feeling the muscles in your arms and legs starting to tingle with activity. Three, becoming more aware of the real surroundings. Four, flexing arms and legs and stretching. Opening your eyes if you had them closed. Five, wide awake and feeling really refreshed. Remembering how well you did in the imagery task and feeling really relaxed, calm and confident about your basketball 2-point and 3-point shooting.

Video Condition Script for Participants in Study 1,2 and 3

Flow is a positive and peak experience, related to total concentration, calmness, and confidence. Participants watch video sessions lasting 15 minutes over two weeks. The video shows experts shooting 2- and 3-point shots from a range of distances and angles, which is consistent with the real performance task they did at pre-test and will do again at post-test, so it seems to be relevant to performance and flow. The video sessions will be conducted on Monday, Wednesday and Friday of each week. The performance and flow post-test will follow the final video session on the second Friday. Participants will be given a different video to watch in each session. Participants will complete a logbook to indicate the dates and times when they completed the sessions and any comments on their experiences during the sessions.

Following is an example of the first part of the video condition script for Studies 1, 2, and 3.

In this session you should relax because relaxation helps people to learn skills from watching expert basketball players shooting. Then you will watch a 2- and 3-point basketball shooting video for 15 minutes. You will observe each shot going through the ring, which should help your own shooting performance. All you need to do during the time when the video is playing is to watch the experts shooting and use that to help you shoot well.

Appendix H

Intervention Logbook

Imagery Log

Please complete the Imagery Log after each imagery session you do. Note the date, time you started and time you finished. Then enter any comments about your experience of that session, including things that worked well for you and anything that was not so good, such as distractions.

Date	Start Time	End Time	Comments

Date	Start Time	End Time	Comments

Video Logbook

Please complete the Video Log after each video session you do. Note the date, time you started and time you finished. Then enter any comments about your experience of that session, including things that worked well for you and anything that was not so good, such as distractions.

Date	Start Time	End Time	Comments

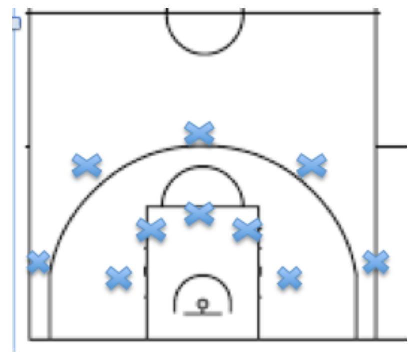
Date	Start Time	End Time	Comments

Appendix I

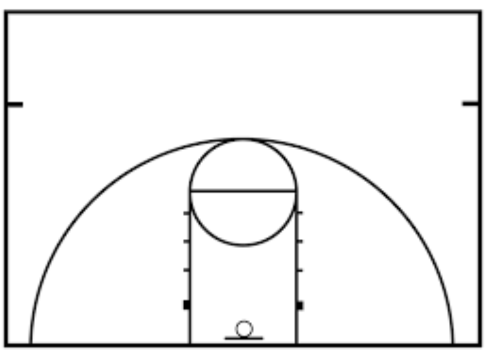
Basketball Shooting Score Sheet

Name: ____Code___________________
Email: ____
Date: ______/______/______ Time: ______________________
Signature____

The task requires the participants to shoot 80 shots; eight times from each of two distances and five angles (8 x 2 x 5 = 80). The first distance is 4.5 metres (two-point shooting). Participants shoot eight times from each of five angles. The second distance is 6.75 metres (three-point shooting).
Scoring system = 0 - 240
3 = for a clean basket
2 = for the ball going in the basket off the ring
1 = for the ball missing the basket off the ring
0 = for the ball completely missing the ring and basket



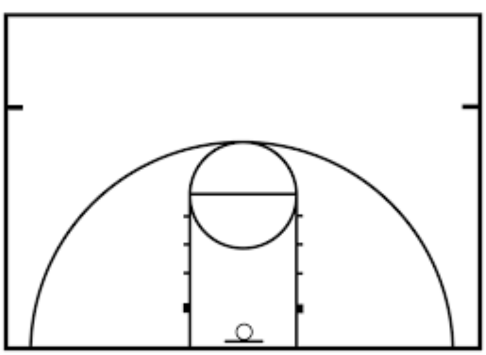
Two-point shooting



1. Right 30___/___/___/___/___/___/___/___
2. Right 60___/___/___/___/___/___/___/___
3. Foul line 90__/___/___/___/___/___/___/__
4. Left 60___/___/___/___/___/___/___/___
5. Left 30___/___/___/___/___/___/___/___

Total score ________________out of 40
and two - point ______________out of 120

Three-point shooting



1. Right 30___/___/___/___/___/___/___/___
2. Right 60___/___/___/___/___/___/___/___
3. Foul line 90__/___/___/___/___/___/___/__
4. Left 60___/___/___/___/___/___/___/___
5. Left 30___/___/___/___/___/___/___/___

Total score ________________out of 40
and three - point ______________out of 120

Total score shoots 80 shots _________________ and the range ______________ out of 240

Appendix J

Debriefing interviews: Imagery Sessions

The debriefing interviews will be short and analysis will be impressionistic. The topics examined to gain insight into participants' experience of imagery, flow, and performance will be based on the following questions:

What was your experience of your imagery during the sessions?

What was your experience of flow during the imagery sessions?

What was your experience of imagery of performance during the imagery sessions?

These questions will be followed up with clarification and elaboration probes as appropriate.

Debriefing interviews: Video Sessions

The debriefing interviews will be short and analysis will be impressionistic. The topics examined to gain insight into participants' experience of imagery, flow, and performance will be based on the following questions:

What was your experience of your imagery during the video sessions?

What was your experience of flow during the video sessions?

What was your experience of imagery of performance during the video sessions?

These questions will be followed up with clarification and elaboration probes as appropriate.

Appendix K

Invitation to Recruit Research Participants

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Institute of Sport, Exercise & Active Living (ISEAL)
College of Sport & Exercise Science
Victoria University
Melbourne
Victoria

10th November 2015

To Whom It May Concern:

Invitation to Recruit Research Participants

We would like to invite basketball players, who are playing in the Spartans MSD Basketball League, Victoria to be part of a study into Enhancing Flow and Basketball Shooting Performance. In this research, we are studying imagery techniques that will help players to experience flow more often and which could also lead to improved shooting performance. Flow is the experience of being so engaged with what you are doing that you are not aware of anything else, even time passing. Flow leads sports performers to increase their enjoyment and motivation, as well as performance.

We are hoping your organization agrees to permit the researchers, Professor Tony Morris and Phatsorn (Ead) Waraphongthanachot of ISEAL, College of Sport & Exercise Science, and Dr Anthony Watt, College of Education and ISEAL, to recruit participants from among the basketball players participating in the MSD League to take part in this research.

Your assistance with recruitment will involve arranging for administrators or coaches to hand the attached invitation letter out to suitable players. We will provide you with sufficient copies of the letter for all the players. If there is any opportunity for Ead to come to talk to players in groups and hand out invitations herself, this could facilitate recruitment. Provision of facilities, including the basketball court used for testing performance is the researchers' responsibility and not an expectation of the organization. Participation in this research involves:

- Players completing a questionnaire about imagery
- then doing a basketball shooting task
- then completing a short questionnaire on flow
- next players do six imagery sessions using techniques related to flow and shooting or watching videos of basketball shooting by skilled performers
- then they do the shooting task and flow questionnaire again
- finally, they have a brief discussion with Phatsorn about their experience

To expedite your response, you are welcome to use the pro forma response below, which can simply be pasted onto your letterhead, signed and faxed (93179881), scanned and emailed (lens2013mel@gmail.com), or mailed (phatsorn.waraphongthanachot@live.vu.edu.au) back to Ead.

We thank you in advance for any assistance you can provide for this important research for the players involved, as well as for enhancing enjoyment, motivation and performance of many sports performers in future.

Any queries about this project may be directed to the chief researcher (Name: Professor Tony Morris ph. 0430 511 543; Email: Tony.Morris@vu.edu.au)

If you have any queries or complaints, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Yours sincerely,

[redacted] พรรษสรณ์ วราพงศ์ธนโชติ [redacted]

Tony Morris
Emeritus Professor
ISEAL

Phatsorn Waraphongthanachot
PhD Candidate
ISEAL

Anthony Watt
Senior Lecturer
ISEAL

College of Sport and Exercise Science
Victoria University
Melbourne

College of Education
Victoria University
Melbourne

Please use the response below or modify it in any way you wish:

Phatsorn Waraphongthanachot
Institute of Sport, Exercise & Active Living (ISEAL)
College of Sport & Exercise Science
Victoria University
Melbourne
Victoria

17th November 2015

Dear Phatsorn,

Re Invitation to Recruit Research Participants

On behalf of the Spartans MSD Basketball Association, I am writing to state that we are pleased to offer our support for your research entitled Enhancing Flow and Basketball Shooting Performance. We will provide opportunities for you to invite basketball players associated with this league to participate in the project.

I wish you success with the project and look forward to hearing about the outcomes.

Yours sincerely,

[ ]

GORDON SINCOCK
PRESIDENT
M&SDBA

Appendix L

Training Diary

Please indicate the amount of time you spend each day doing basketball-shooting practice. Complete one row each evening for that day or each morning for the previous day.

Date	Amount of time (minutes)