Physical Activity and Depression among Overweight Women with Type 2 Diabetes Mellitus

Melissa Louise Moore

Student ID: 3689029

School of Sport and Exercise Science

Faculty of Arts, Education and Human Development

Victoria University

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Doctor of Philosophy Declaration

"I, Melissa Louise Moore, declare that the PhD thesis entitled 'Physical Activity and Depression among Overweight Women with Type 2 Diabetes Mellitus' 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".

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Abstract

The aim of this thesis was to investigate the relationship between physical activity (PA) and depression in overweight women with Type 2 Diabetes Mellitus (T2DM). To do this, I conducted three linked studies. In Study 1, I examined the relationship between PA and depression in overweight women with T2DM. In Study 2, I explored the PA barriers and facilitators for overweight women with T2DM and depression, and in Study 3, I designed and implemented a psychological intervention aimed at increasing PA participation and adherence for overweight women with T2DM and depression. Study 1 recruitment occurred over approximately 12 months. During this time, 981 questionnaire packs containing a demographic information form, the Hospital Anxiety and Depression Scale (HADS), and the Scottish Physical Activity Questionnaire (SPAQ), were distributed to several diabetes clinics in Melbourne (whose clinic manager agreed to assist with the recruitment phase). Response rate was low (77/981; 7.85%), and data from 61 participants were included in the study. Results highlighted the prevalence and severity of depression in overweight women with T2DM: 83.6% of participants reported at least a mild level of depression, with 44.3% indicating a severe depression level. The main PA types reported were active housework and walking. There was a trend toward a negative correlation between depression and overall leisure-based PA, and a significant negative relationship between depression and active housework. There was no significant difference in the depression level between participants (n = 33) who perceived themselves as non-active (according to the transtheoretical model), and those (n = 28) who considered themselves to be regularly active. Considering the findings of Study 1 and those of previous research indicating the negative relationship between depression and PA for overweight women with T2DM, I conducted Study 2. This study involved semi-structured interviews to

explore the PA barriers and facilitators for overweight women with T2DM and depression. Eleven participants from Study 1 who had scored 8 or more on the HADS-D (indicating at least a mild level of depression) took part. I conducted two inductive content analyses. In one inductive content analysis (ICA) I identified participants' barriers to PA, that is, factors that participants claimed hindered their PA participation. In the other ICA, I examined factors that facilitated their PA behaviour, that is, encouraged them to participate. With reference to barriers, I identified four general dimensions (GDs), and eight second-order themes (presented in parentheses): health limitations (functional limitations for activity of daily living, psychological health limitations, adverse reaction to substances); lack of motivation (low exercise priority); effect of past sedentary behaviour (low exercise self-efficacy, effect of past sedentary behaviour); and environment (lack of exercise opportunity, lack of social support). It was evident that although depression was a reported barrier in its own right, depression was also connected to other reported barriers, such as physical and physiological health limitations (e.g., overweight or obese status, low energy, and tiredness), low exercise priority, low exercise self-efficacy, and lack of social support. With reference to participants' facilitators, I identified three GDs and six second-order themes: to improve health (to improve physical/physiological health, to improve psychological health and well-being); instrumental PA (instrumental facilitator's to PA); and the positive role of others (social support/encouragement, comparativeness). Using information gained form Studies 1 and 2, and previous research findings, I designed and implemented a 12-week psychological intervention to increase PA participation and adherence suitable for overweight women with T2DM and depression. The purpose of Study 3 was to explore the individual experiences of six women, particularly in relation to the effectiveness of the intervention on their self-reported PA and mood (e.g., depression), over a 24-week

period (i.e., 12-week intervention and 12-week follow-up). All participants had taken part in Study 2, and were invited to participate in an individualised lifestyle PA consultation (LPAC) intervention. The intervention was based on the guidelines of Loughlan and Mutrie (1995) and Kirk, Barnett, and Mutrie (2007), and consisted of a one-off initial LPAC, and two LPAC support phone calls (Week 8, Week 12) specifically tailored to the individual's baseline PA stage of change (according to the transtheoretical model). During the intervention, I utilised various psychological strategies, such as identifying and overcoming individuals' barriers, goal setting, increasing self-efficacy, and encouraging social support to assist with participants' PA participation. Qualitative procedures (i.e., case-study design) were the primary mode of data collection and analysis. Participants took part in three semi-structured interviews. The first (baseline) interview took place approximately one week prior to the LPAC intervention, the second (Week 16) interview was conducted 4 weeks after the intervention ended, and the third (Week 24) interview was conducted 12 weeks after the intervention ended. Thematic analysis was used to explore participants' experiences. Quantitative measures of PA and depression were used as an auxiliary to participants' qualitative accounts. Thus, at several time points, participants completed and returned the HADS and SPAQ (i.e., at baseline, and during Week 8, 12, 16, and 22 after the initial LPAC), and/or a seven-day PA log (i.e., at baseline, and during Week 3, 6, 9, 12, 15, 19, and 23). There were individual differences in participants' experiences, particularly regarding their PA and mood changes (or lack of) during the follow-up period. Overall however, all women found the LPAC intervention beneficial in increasing their psychological readiness (e.g., PA awareness, motivation, and intention). Most women also increased their self-reported PA participation. The intervention appeared particularly useful in increasing PA participation for women who were

contemplating or preparing to increase their PA. Specifically, based on participants' Week 16 and Week 24 interview accounts, three participants reported a sustained increase in their PA behaviour at Week 24, and expressed enthusiasm and intention to continue with their PA behaviour beyond the study period. One woman reported an increase in PA at Week 16 (i.e., 4 weeks following the intervention cessation); however, worsened health status prevented her from sustaining her increased PA level during Week 16 to Week 24. Nevertheless, her intention to increase PA once her health improved was evident. For two participants, who both reported inactivity and a high depression level at baseline, PA behaviour and mood status remained relatively unchanged during the intervention and follow-up period. Although both participants acknowledged an increased awareness of the need to be physically active, elevated depression was the main factor hindering their PA participation. Moreover, during the intervention and follow-up period, an inverse reciprocal relationship between PA and mood was evident in all participants. Women who remained relatively inactive were more likely to report a reciprocal relationship between low mood (e.g., moderate to severe depression level) and low PA; whereas women who had increased their PA behaviour more often spoke about the positive influence of their PA behaviour on their mood, which facilitated further PA intention and participation. Overall, the findings of the present thesis highlight the prevalence and severity of depression, and the negative relationship between leisure-based PA and depression in overweight women with T2DM. Additionally, the intervention study showed promising results for a psychological intervention, based on a PA consultation approach, for increasing PA intention and/or participation, and improving mood (i.e., reducing depression) in overweight women with T2DM and depression. The implications of the current thesis are relevant to researchers and practitioners alike. Many suggestions are made

throughout the thesis for important areas of further research, including examining the influence of diabetes-related complications on depression risk and PA participation for this population. To investigate the full effect of PA consultation for this population it is recommended that researchers undertake large-scale PA consultation interventions, using RCT designs, employing mixed modes of data collection (i.e., repeated semi-structured interviews, self-report and objective measures of PA, alongside diabetes control indicators). This thesis may have implications for people who work with overweight women with T2DM, in particular diabetes specialists, weight specialists, psychologists, exercise professionals, spouses, family members, and friends of overweight women with T2DM. Finally, the findings of the current thesis should also be applicable to people with other chronic physical conditions and depression, especially where PA is an key component of the treatment for the physical condition.

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The journey to completing my PhD has been, and will be, one of the most challenging yet rewarding journeys I have completed. Along the way, I have learnt many valuable skills, had the privilege of sharing and receiving knowledge, and was blessed to have a supporting network of people around me, professionally and personally, which allowed me to complete the PhD journey...relatively unscathed!

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List of Abbreviations

AL	Active Living
ADL	Activities of Daily Living
BMI	Body Mass Index
CD	Clinical Depression
DBS	Decisional Balance Sheet
DS	Depressive Symptoms
FL	Functional Limitations
HADS	Hospital Anxiety and Depression Scale
HADS-D	Hospital Anxiety and Depression Scale- Depression Sub-Scale
LPAC	Lifestyle Physical Activity Consultation
PA	Physical Activity
RCT	Randomised Control Trials
SPAQ	Scottish Physical Activity Questionnaire
SOC	Stage of Change
T2DM	Type 2 Diabetes Mellitus

Chapter 1: Introduction

Type 2 Diabetes Mellitus (T2DM) is a lifestyle-related disease, and a major health problem in Australia, accounting for approximately 90% of all diabetes cases (Australian Bureau of Statistics [ABS] 2009; World Health Organisation [WHO], 2009a). According to WHO statistics, one in 20 deaths worldwide are attributable to diabetes, and this figure is projected to double by the year 2030 (WHO, 2010). Approximately 80% of people with T2DM are overweight or obese (Hensrud, 2001; U.S. Department of Health and Human Services [USDHHS], 2008). The strong association between T2DM and overweight is concerning, because they are independent health problems, and increase the risk of numerous other health conditions, including depression (ABS, 2009). In Australia over the last 15 years, the prevalence of mental health disorders has almost doubled. Current estimates suggest one in five (or 20%) of Australian adults experience a mental health condition, such as depression (Australian Institute of Health and Welfare [AIHW], 2010). Compared to the general population, people who are more likely to report depression include females, individuals with chronic health problems (e.g., diabetes, overweight, coronary heart disease [CHD]) or those who engage in low levels of physical activity (PA; ABS, 2009; Luppino et al., 2010; Mazuk et al., 2008). Experiencing depression is particularly problematic for people with diabetes, because compared to those without depression, individuals with diabetes *and* depression are more likely to report poor diabetes management (e.g., glucose control; Williams et al., 2006), progression, and prognosis (Lin et al., 2010); and have a greater risk of additional health problems (e.g., cardiovascular disease; Katon et al., 2003), and economic burden (Piette et al., 2004).

Despite numerous known health benefits of regular PA, particularly for prevention and management of T2DM (Pi-Sunyer, 2007) and overweight (Wing & Phelan, 2005), nearly three-quarters (70%) of Australia's adult population do not

engage in enough PA to gain health benefits (ABS, 2009). Individuals who are female, with diabetes, overweight, or experiencing depression, are even less likely to engage in regular PA (ABS, 2009). Therefore, overweight women with T2DM are a population at high risk for depression and physical inactivity. To date however, there is little research about the relationship between depression and self-reported PA in this population.

Numerous quantitative studies have been conducted to investigate the barriers to and facilitators for PA participation among female adults (Ansari & Lovell, 2009), people with T2DM (Korkiakangas, Alahuhta, & Latinien, 2009), people who are overweight (Jewson, Spittle, & Casey, 2008), and those with elevated depressive symptoms (Craft, Perna, Freund, & Culpepper, 2008). There is a lack of qualitative research which has examined these factors in people with T2DM (Mier et al., 2007). I found no qualitative studies that have examined the PA barriers and facilitators for women with all three health problems: overweight, T2DM, and depression. Therefore, little, if anything is known about what may hinder or encourage PA participation, for overweight women with T2DM and depression.

A reciprocal relationship has been found between high levels of depression and poor PA adherence, including among people with diabetes (Koopmans et al., 2009), individuals who are overweight (Ball, Burton, & Brown, 2008), and people with elevated depressive symptoms (Ussher et al., 2007). Thus, in addition to physical inactivity, the risk of poor adherence to PA can be considered even higher for overweight women with T2DM and depression. This is concerning, because to sustain the health benefits of PA, regular participation needs to be maintained (Praet & van Loon, 2008**)**. Fortunately, research evidence suggests the psychological benefits of PA (e.g., reduced depression) can facilitate PA adherence (Hamer et al., 2009; Mier et al., 2007). No research however has investigated the existence of an inverse reciprocal relationship between PA and depression in overweight women with T2DM and

depression, that is, a relationship in which PA increases as depression reduces and depression decreases as people participate in more physical activity.

Over the last 20 years, researchers have found theory-based PA interventions using psychological strategies, to be more successful in increasing PA participation and adherence, than structured pre-determined exercise interventions (Baranowski, Anderson, & Carmack, 1998; Plotnikoff, 2004). Support for psychological intervention has been shown in the adult population (Marcus et al., 2006), people with diabetes (Plotnik, 2004), people who are overweight (Andersen et al., 1999), and people with depression (Richardson, Avripa, Neal, & Marcus, 2005). PA consultation (previously labelled exercise consultation) is one type of intervention based on the transtheoretical model, which uses a range of psychological strategies aimed at promoting PA participation and adherence. Such strategies include goal setting, increasing self-efficacy, identifying and overcoming PA barriers, and encouraging enjoyable activities (Kirk, Barnett, & Mutrie, 2007; Laughlan & Mutrie, 1995). A number of research findings suggest the usefulness of PA consultation for increasing PA participation and adherence in people with T2DM (Kirk, Mutrie, McIntyre, & Fisher, 2003; Lowther, Mutrie, & Scott, 2002) and CHD (Hughes, Mutrie, & McIntyre, 2007). There is only limited research examining the effectiveness of PA consultation in people with depression. Extensive literature searches revealed only one study that investigated and demonstrated the effectiveness of PA consultation for increasing PA and adherence among people with CHD *and* depression (Rogerson, 2009). In view of Rogerson's study outcomes, and recommendations for promoting PA in people with depression which are consistent with PA consultation components (Seime & Vickers, 2006), I consider a PA consultation to be well suited for overweight women with T2DM and depression. Future research examining the suitability and effectiveness of a PA consultation for this population is clearly warranted.

Thus, there were three main purposes of this thesis that were linked through three studies. In Study 1, I aimed to examine the relationship between PA and depression in overweight women with T2DM; in Study 2, I explored the PA barriers and facilitators among overweight women with T2DM and depression; and, in Study 3, I examined the experiences of overweight women with T2DM and depression in relation to participating in an intervention designed to increase self-reported PA participation and adherence, and any associated changes in mood.

Chapter 2: Literature Review

The literature relevant to this thesis is reviewed in this chapter. I begin the chapter by outlining the search strategy used, defining the important terms, and highlighting common methods used to measure the key constructs of the present research. Next, I discuss the aetiology, risk factors, and burden of T2DM, overweight, and depression. Following this, I examine the relationship between depression and T2DM, focussing on depression as a risk factor for T2DM; and, depression as a consequence of T2DM. I then discuss the gender difference in the prevalence of depression in adults with T2DM and/or overweight, with women being more at risk than men. Next, I discuss the physical and psychological health benefits of regular PA. I discuss the problem of physical inactivity, address three theoretical models of behaviour change, and highlight factors that have been reported to facilitate or inhibit PA participation. I then explore the reciprocal relationship between PA and depression. Towards the end of the chapter, I review PA interventions for increasing PA participation and adherence, focusing on one particular intervention type, known as physical activity consultation. I discuss evidence for PA consultation as an intervention for increasing PA adherence, particularly for people with T2DM. The final section of the chapter includes a statement of the purpose of this thesis.

Search Strategy

I commenced the literature search for this PhD in the initial stages of this thesis, in August 2006. Literature searches were more comprehensive during the periods of writing the literature review, and when finding literature relevant to each of the study findings. To ensure the most up to date literature was reported in this thesis however, I regularly conducted literature searches on key themes up until the final weeks before submission, in December 2010. In the initial stages of preparing the literature review, I did not restrict the year range when searching for articles, to ensure I included key

studies. In the later stages of writing the dissertation, I focused on more recent literature, particularly research that had been conducting from 2000 onwards. The main databases searched: SPORTDiscus; Ebsco Megasuite; PsyclNFO; and a number of freely-available online health promotion and physical activity-related databases. I used the internet extensively to search for studies and locate information generated by physical activity, depression, and health promotion bodies throughout the world (e.g., AusPAnet). Examples of key words used (although not limited to): overweight, obesity, depression, mood, diabetes, type 2 diabetes, women, physical activity, exercise, sport, lifestyle physical activity, barriers, facilitators, motivators, intervention, consultation.

Definitions and Measures

An important element of any research is the ability to compare findings with outcomes from similar research. For comparisons to be made, the main constructs of interest need to be clearly defined and assessed using valid and reliable measures. Therefore, in this section, I clearly define and highlight common methods of measuring the key constructs of the present research, namely physical activity (PA) and its sub-types, active living (AL), depression (depressive symptoms and clinical depression) and overweight and obesity.

Physical Activity

PA is a broad term that includes all bodily movement produced by the skeletal muscles that results in energy expenditure (Berger, 2004; Casperson, Powell, & Christenson, 1985). Therefore, PA covers all types of activity that require movement. Common PA sub-types include exercise, sport, occupational, transport, and lifestyle activities. For the purpose of this review, a distinction between exercise and lifestyle PA is warranted**.**

Exercise. Exercise involves planned, structured, continuous bouts of activity, which people typically take time out of their daily routine to take part in. They can be solitary in nature, or performed in a group setting. Like all types of PA, there are numerous reasons why people exercise regularly, including for enjoyment, social reasons, and/or to achieve specific health benefits, such as weight management or physical fitness. Examples of exercise types include swimming, cycling, brisk walking, resistance training (RT), and attending a group exercise class (Berger, 2004; Casperson, Powell, & Christenson, 1985).

Lifestyle physical activity. There are two key elements of lifestyle PA that distinguish this type of PA from exercise: lifestyle PA is unstructured, because a person does not need to take time out of their daily routine to be active; and lifestyle PA can be accumulated throughout the day, rather than in one continuous bout. As such, lifestyle PA includes active modes of instrumental activities of daily living (IADL; Bookman, Harrington, Pass, & Resner, 2007). Examples of lifestyle PA include gardening, climbing stairs, active household chores (e.g., mopping the floor), and parking the car a little further from the desired destination and walking the rest of the way (Andersen, Crespo, Barlett, Cheskin, & Pratt, 1998; Berger, 2004; Dunn et al., 1999). Research has demonstrated that achieving the minimum 30 minutes of daily PA via the accumulation of short bouts (e.g., 10 minutes) of moderate intensity PA can have equivalent health benefits to a continuous bout of exercise (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005; see Appendix A [Table A2.4] for outcomes from research and reviews comparing health benefits of lifestyle PA and exercise). Therefore, engaging in a sufficient amount of daily PA via lifestyle PA can be considered a healthful advantage of living an active lifestyle. Lifestyle PA is an appealing alternative to exercise, particularly for people who dislike exercise, or are discouraged by other factors preventing them from

engaging in exercise programs (e.g., transportation to the fitness centre, membership fees). Additionally, overweight individuals (Andersen et al., 1999), individuals with T2DM (Kirk, Barnett, & Mutrie, 2007; Kirk, Mutrie, McIntyre, & Fisher, 2003), and people with depression (Richardson et al., 2005) prefer lifestyle PA as opposed to exercise. Given the global problem of inactivity (WHO, 2010b), and the appeal of lifestyle PA, the main expert bodies on PA recommendations (American College of Sports Medicine (ACSM); the Australian Government Department of Health and Ageing; and the Centers for Disease Control, and Prevention) encourage lifestyle PA for attaining health benefits (see Table 2.1 for PA recommendations).

Active Living

AL is a broad concept that embraces the full spectrum of PA, and describes it as being an essential part of daily living (Bouchard, Blair, & Haskell, 2006; Fitness Canada, 1991; Makosky, 1994; NSW Premier's Council for Active Living (NSW PCAL), 2010; Swedburg, & Izso, 1994). The concept AL gives individuals the flexibility to incorporate PA in to their daily life in a way that suits their needs, abilities, preferences, and environment. Furthermore, there is no hierarchy of activities, and no value judgements to the relative merits of one PA type compared to another (Swedburg, & Izso, 1994). The main goal of AL is that individuals are attaining the daily PA recommendations, regardless of what PA type/s they engage in to achieve this. Thus, advocating an active lifestyle, rather than encouraging a particular type of PA, may be a more effective approach to combating the current worldwide epidemic of inactivity (NSW PCAL, 2010). Throughout this thesis, I use the term PA on most occasions to describe any bodily movement that increases energy expenditure above basal level. I employ the terms PA, exercise, lifestyle PA, and AL when researchers have used these

terms, or if what researchers have described was specifically covered by one of these terms, according to the aforementioned definitions.

Measuring physical activity behaviour. PA is a complex entity with numerous diverse components (e.g. type and intensity). Consequently, numerous ways of measuring PA exist, including self-report questionnaires (varying in recall time ranges, such as daily-, seven day-, and 1 year- recall), PA diaries or logs, behavioural observation, motion sensors, and physiologic markers (e.g., heart rate, doubly labelled water). It is for this reason that in this thesis, I mention the type of tool researchers have used to measure PA behaviour in each of the studies discussed. The most accurate measures of PA are considered to be those that reflect changes in aerobic fitness (e.g., maximal oxygen consumption test; VO_2 max), however, these methods are the least practical in terms of cost, time, and burden on the participant (Dale, Welk, & Matthews, 2002). Consequently, self-report questionnaires, which are inexpensive, non invasive, and highly practical, are the most frequently used, particularly in large population studies or when resources are limited (Haskell & Kiernan, 2000; Dale et al., 2002). The challenge for researchers examining PA is selecting the most appropriate, accurate, and reliable mode of measurement. Such selection depends on the nature of the study population, study purpose (e.g., what aspect of PA the researcher wants to measure), and the resources available (Dale et al., 2002; Haskell & Kiernan, 2000; Troiano, 2009). Numerous well validated and reliable self-report PA measures exist that include a broad range of PA and have been widely used in research. These include the Scottish Physical Activity Questionnaire (SPAQ; Lowther, Mutrie, Loughlan, & McFarlane, 1999), the Active Australia Survey (Australian Institute of Health and Welfare [AIHW], 2003); seven-day Physical Activity Recall (Sallis et al., 1985), the International Physical Activity Questionnaire short and long version (Craig et al., 2003), and the Paffenbarger

Physical Activity Questionnaire (Paffenbarger, Wing, & Hyde, 1978). For the purposes of the current thesis, the SPAQ was used to measure self-report PA participation. More information on the SPAQ is provided in Chapter 3 of this thesis.

Depression

The term "depression" is widely used in research to refer to a range of symptoms and mental health conditions/illnesses, from mild depressive symptoms (DS) to clinical depression (CD; also known as major depression, major depressive disorder [MDD], or unipolar depression), as diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association [APA], 2000). Other examples of mood disorders classified according to the DSM-IV-TR (APA, 2000) include (although not limited to) dysthymic disorder, and depressive disorder not otherwise specified (APA, 2000). In addition to the varied use of the term depression, numerous diagnostic tools and criteria to measure and define depression exist. Consequently, determining precise prevalence rates of depression is difficult. So too is comparing findings among studies. Thus, as mentioned, defining the term depression and decided which depression measure to use is an important element of any mental health research. It is for these reasons that in this chapter, I mention the type of depression measured, and the tool to measure depression in each of the studies discussed (e.g., MDD, CD, minor depression, DS, and depressed mood). For the purposes of the current thesis, an elaborate discussion on the different types of mental health conditions for which the term depression has been used is not necessary, a distinction between two main mental health problems, CD and DS, is however warranted. Moreover, because the focus of the present thesis is DS, unless otherwise stated, when referring to and discussing the studies of this thesis, I use the term depression to refer to DS.

Clinical depression. According to the DSM-IV-TR, to be classified with CD, either a depressed mood or loss of interest or pleasure in most activities must be experienced nearly every day, for at least two consecutive weeks. Additionally, four or more of the following factors (that are unrelated to a general medical condition, substance abuse, bereavement, or mood-incongruent delusions or hallucinations) must be simultaneously present during the same 2-week period, and cause clinically significant distress or impairment in everyday functioning: significant weight loss (without dieting) or weight gain, appetite changes, insomnia or hypersomnia, psychomotor agitation or retardation (based on subjective feelings and others' observation), fatigue or loss of energy, feelings of worthlessness or excessive or inappropriate guilt, decreased ability to think or concentrate, recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide (APA, 2000; Gruenberg, Goldstein, & Pinaus, 2005). CD can also be classified as either "single episode" or "recurrent", depending on whether the depression episodes occur as discrete events, or reoccur throughout the individual's lifespan. Moreover, CD can be further categorised as mild, moderate, or severe without psychotic features, or severe with psychotic features (APA, 2000). The "gold standard" for diagnosing CD is considered to be the clinical interview (Blumenthal, 2008). Thus, CD requires a medical diagnosis from trained health professionals, such as psychologists and psychiatrists. Commonly used structured diagnostic interviews that allow for a DSM-IV diagnosis of CD include: the National Institute of Mental Health Diagnostic Interview Schedule (DIS; Robins,Helzer, & Ratliff, 1981) and the Composite International Diagnostic Interview (CIDI; WHO, 1990).

Depressive symptoms. DS (also referred to as depressed mood; DM) is a subjective state that does not require a medical diagnosis. Most people will experience DS (or DM) at some or many stages in their life, for numerous reasons. Examples of instances which can trigger DS include moving house, receiving a lower the expected examination grade, marriage, divorce, job loss, or one's own self-identity appraisal (Kessler, 1997; Tennant, 2002). Additionally, a diagnosis of, and experiencing chronic illnesses like T2DM (e.g., adverse side effects, life disruption related to strict management regimens) can bring about, or elevate existing DS. Because of the subjective nature of DS, different people will experience different DS, and at varying levels of severity. Thus, when describing DS, some individuals may emphasise symptoms, such as feelings of unhappiness, sadness, hopelessness, emptiness, or being "down in the dumps" (Compas, Ey, & Grant, 1993; Holsen, Kraft, & Vitterso, 2000), whereas others may highlight somatic complaints (e.g., bodily aches and pains). Moreover, experiencing DM can increase a person's irritability (e.g., persistent anger, anger outbursts, blaming others for mishaps, or excessive frustration over minor matters; APA, 2000).

Measuring depressive symptoms. There are many self-report mood measures/questionnaires used in research, such as the Profile of Moods State (POMS; McNair, Lorr, & Droppleman, 1971), Centre for Epidemiological Studies Depression Scale (CES-DS; Radloff, 1977), Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), the Geriatric Depression Scale (GDS; Yesavage et al., 1983) and the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). Self report measures do not require administration by a trained professional, and they are commonly used as a continuous (rather than categorical) assessment of DS (Creed & Dickens, 2007). Therefore, self-report measures do not classify CD according

to the DSM-IV categories; instead, they measure depressive symptomatology, or DM. Some questionnaires, such as the BDI, and the HADS have validated cut-off points to distinguish between mild/minor, moderate, and major/severe levels of depression. Additionally, each questionnaire has varying psychometric properties, especially in terms of sensitivity and specificity for detecting depression (Davidson, Rieckmann, & Rapp, 2005).

An important task for any researcher is to select the most appropriate depression measure for their study. This is particularly crucial for researchers using self-report measures to examine depression in populations with physical health issues, such as diabetes, renal failure, or rheumatoid arthritis (Creed & Dickens, 2007). Most self-report measures (such as the BDI and CES-DS) were originally designed for use in the general or psychiatric population, but not for use in medically ill populations. Consequently, such measures include physical (bodily) symptoms of depression, such as fatigue, weight loss, pain, and anorexia. Since these physical symptoms may be a direct result of physical illness, administering these depression measures to people with physical health issues could lead to inflation in their depression score simply because of the presence of a physical illness. This phenomenon is termed “criterion contamination” and is responsible for some studies finding extremely high rates of depression in medically-ill populations (Creed & Dickens, 2007). To overcome this problem, some questionnaires such as the HADS and the GDS have been designed for, and validated in, medically ill populations where physical health problems are common. The HADS is probably the most commonly used because it excludes physical symptoms of depression (e.g., appetite loss, weight loss, sleep disturbance, fatigue, decreased sexual drive, poor concentration, and psychomoter changes), and is easy to complete and score (Creed & Dickens, 2007). The HADS has been found to be a reliable and valid measure for

measuring depression and anxiety in both clinical and general populations (Bjelland, Dahl, Haug, & Neckelmann, 2002). As such, it has been widely used by researchers examining depression in diabetic populations. More information on the HADS is provided in Chapter 3 of this thesis.

Overweight and Obesity

In 1997, the World Health Organisation (WHO) developed a standard definition of overweight and obesity, which is based on Body Mass Index (BMI), and is the current international classification. A person's BMI is formulated by dividing their weight (in kilograms) by their height in metres squared [kg/m^2] (Kuczmarski & Flegal, 2000). According to this criterion, for adults (18 years and older), normal weight is considered to be a BMI between 18.5 and 24.9, all-inclusive overweight is defined as a BMI of 25 of more, overweight but not obese, known as pre-obese, is defined as a BMI between 25.0 and 29.9, and a BMI of 30 or more is considered to be obese (WHO, 2009c). In this thesis and review, I use the WHO criterion to define overweight and obesity (overweight, BMI: 25.0-29.9; obese, BMI: ≥30). Also, in the present thesis, self-reported weight and height was used to formulate participants BMI. Moreover, to eliminate confusion, unless specified otherwise, I use the term overweight to refer to both overweight and obese individuals (BMI ≥ 25).

Aetiology, Risk Factors, and Burden of Three Chronic and Interrelated Conditions: Type 2 Diabetes Mellitus, Overweight, and Depression

T2DM, overweight, and depression (across the severity spectrum), are all highly prevalent chronic conditions, and continue to be at the forefront of public health dilemmas for countries worldwide, including Australia. These three conditions are risk factors for each other, and they each represent a major problem in their own right, with independent risk factors, and significant health and economic burdens on an individual and social level. For worldwide and Australian prevalence statistics of diabetes, overweight, and depression, see Appendix B (Table B2.5), and Appendix C (Table C2.6), respectively. In this section, I discuss the risk factors, health, and burden for these health conditions. For the purpose of the present thesis, because T2DM and overweight are highly prevalent co-occurring conditions, the shared health problems and burden for these two conditions are presented. Moreover, for the remainder of this chapter, unless stated otherwise, focus will be on T2DM. Overweight will not be discussed as a separate health problem.

T2DM Aetiology and Risk Factors

Diabetes Mellitus (DM) is a leading worldwide public health challenge of the 21st Century (Barr et al., 2006; Zimmet, Alberti, & Shaw, 2001), particularly T2DM (Martinus et al., 2006). In Australia since 1996, DM has been labelled one of the seven National Health Priority Areas (NHPA's; Commonwealth Department of Health and Aged Care and AIHW, 1999). Specifically, DM is a chronic illness that refers a group of metabolic disorders, including (although not limited to) Type 1 Diabetes Mellitus, T2DM, gestational diabetes, maturity-onset diabetes of the young, drug or chemical-induced diabetes, and uncommon forms of immune-mediated diabetes. Most DM cases

are either Type 1 or T2DM (American Diabetes Association [ADA], 2007a), with T2DM representing approximately 85%-95% of all DM diagnoses (ADA, 2007a; The Task Force on Diabetes and Cardiovascular Diseases [TFDCD], 2007; WHO, 2009a). The characterising feature of DM is hyperglycemia (also known as high blood glucose), which is the result of defects in the secretion and/or action of the hormone insulin. Consequently, for people with DM, their body is unable to use glucose (sugar) for energy; therefore glucose builds up in their blood (ADA, 2007a). For the purpose of this review and research, from this point on, I discuss T2DM unless stated otherwise.

The main T2DM risk factors are lifestyle related, namely impaired glucose intolerance, poor diet, physical inactivity, and overweight, particularly in the abdominal region (ADA, 2007a; AIHW, 2008; Barr et al, 2006; TFDCD, 2007). Not surprisingly, the majority (about 80%) of people with T2DM are overweight (Hensrud, 2001; USDHHS, 2008), and physically inactive (ABS, 2006c; Martinus, et al., 2006; TFDCD, 2007). Furthermore, worldwide prevalence figures (Morabia & Costanza, 2005; Nelson, Reiber, & Boyko, 2002; Sullivan, Morrato, Ghushcyan, Wyatt, & Hill, 2005) and findings from numerous prospective studies, with follow-ups ranging from 7 years (Weinstein et al., 2004) to 16 years (Rana, Li, Manson, & Hu, 2007), show that overweight, physical inactivity, and T2DM, are significant independent risk factors for each other, and for diabetes-related conditions, such as hypertension (high blood pressure). For example, in a 16-year follow-up study involving 68, 907 women who participated in the Nurses' Health Study, Rana et al. reported that obese ($BMI \geq 40$) women had around a 28-fold higher risk of T2DM than normal weight ($BMI < 21$) women. Physical inactivity was also associated with an increased risk of T2DM, independent of BMI. Moreover, inactive women with a high BMI had an even greater risk of T2DM than those with one, or none of these risk factors (Rana et al., 2007).

Additionally, depression is also a significant independent risk factor for T2DM. The negative influence of depression on T2DM risk is discussed in the next section of this chapter. Furthermore, there is a genetic predisposition for T2DM, however this predisposition is complex, and not clearly defined (ADA, 2007a; Fowler, 2007), so it will not be considered further.

T2DM Associated Health Problems and Burden

As previously mentioned, although T2DM and overweight are both standalone problems, they are highly prevalent co-occurring conditions (e.g., approximately 80% of people with T2DM are overweight), and share most of the same health problems and burden. For example, people with T2DM and/or overweight have an increased risk of numerous diseases, including coronary heart- cardiovascular-, peripheral arterial-, gallbladder-, and cerebrovascular- disease; stroke; and osteoarthritis (ADA, 2007a; Barr et al., 2006; Gavin, Peterson, & Warren-Boulton, 2003; TFDCD, 2007; WHO, 2007). Being overweight can increase the likelihood of several types of cancer, including colon, breast, oesophagus, endometrium, and kidney cancer. The risk of myocardial infarction (heart attack) is also as high in people with diabetes as it is for people without diabetes who have previously suffered a myocardial infarction (Haffner, Lehto, Ronnemaa, Pyorala, & Kaakso, 1998). Not surprisingly, increased risk of mortality has been linked to both diabetes (ABS, 2009), and overweight (ABS, 2009; Hu et al., 2004; Katzmarzyk, Craig, & Bouchard, 2001; Stevens, Cai, Evenson, & Thomas, 2002).

Chronic hyperglycemia can lead to numerous diabetic complications, including specific long-term organ damage, such as retinopathy (with potential blindness), nephropathy (with the risk of renal failure), peripheral neuropathy (with the risk of foot ulcers), amputation, Charcot joints, autonomic neuropathy (which can cause

gastrointestinal, genitourinary, and cardiovascular symptoms), and sexual dysfunction (ADA, 2007a; Sheila, 2005; TFDCD, 2007).

People with T2DM or overweight may also have fewer years of disability free life, and increased burden on physical and work disability (Gregg et al., 2000; Ryerson et al., 2003; Von Korff et al., 2005). For example, overweight people are more likely than non-overweight people to retire earlier, have higher absenteeism rates, go to nursing homes at younger ages, and to be disabled (Kim & Popkin, 2006). People with diabetes have also been shown to have a shortened life expectancy by up to 15 years (Davies, Tringham, Troughton, & Khunti, 2003). Psychological problems, such as depression, are highly prevalent comorbidities with each T2DM (Anderson, Freedland, Clouse, & Lustman, 2001; Pouwer et al., 2010; Roupa et al., 2009) and overweight (Faith, Matz, & Jorge, 2002; Friedman & Brownell, 1995; Kim & Pokpkin, 2006; Rejeski et al., 2006; Stunkard, Faith, & Allison, 2003; Goodman & Whitaker, 2002). An in-depth discussion of the T2DM and depression comorbidity is warranted, and is provided in the next section of this chapter.

Inevitably T2DM and overweight each incurs a substantial economic burden, at an individual (Reidpath, Crawford, Tilgner, & Gibbons, 2002; Seidell, 1998), and societal level (Colagiuri et al., 2010; Colditz, 1999; Katzmarzyk & Janssen, 2007; Seidell, 1998). For example, people with diabetes have per capita and out-of -pocket medical expenses two to five times greater than those without diabetes (AIHW, 2008; Greden, 2001). The costs are even greater for people with diabetes-related complications (Colagiuri, Colagiuri, Conway, Grainger, & Davey, 2003). Moreover, according to recent estimates (based on 5-year follow-up data from the Australian Diabetes, Obesity and Lifestyle study, collected in 2004–2005), the total annual cost of overweight and obesity in Australia is at least $21 billion (Colagiuri et al., 2010). Therefore, the health and economic costs are likely to be even greater for overweight people with T2DM.

Diabetes management. The main aim of diabetes management is to improve glucose control and insulin sensitivity. Effective management of T2DM requires a patient-focused, interdisciplinary team approach involving several health professionals, such as diabetes specialists, dieticians, exercise physiologists, psychologists, and podiatrists (ADA, 2007b; Aschner et al., 2007). Because T2DM is largely a lifestyle-related disease however, the individual with diabetes plays an active role in their care (Van Der Van, Weinger, & Snoek, 2002). Key components of an effective self-care management regimen include blood glucose monitoring, a low fat diet, regular PA, and education on diabetes management (Flood & Constance, 2002; Mahler & Adler, 1999; Proirer, 2001; Sheila, 2005). It is important to note lifestyle modifications, such as diet and regular PA, are also key components in the prevention of T2DM (Pi-Sunyer, 2007), and prevention and management of overweight (Wing & Hill 2001; Wing & Phelan, 2005), however, because this thesis is concerned with women who have diagnosed T2DM and are overweight, I will not elaborate on the prevention of these health problems.

Health benefits of modest weight loss. Fortunately, even modest weight loss (e.g. 5% to 10% of initial body weight) can have beneficial outcomes on a number of health parameters and disease outcomes (Racette, Deusinger, & Deusinger, 2003; Stewart, Tikellis, Carrington, Walker, & O'Dea, 2008), and substantial economic benefits (Agren, Narbro, Naslund, Sjostrom, & Peltonen, 2002). Some of the health benefits include (although they are not limited to) a reduction in T2DM (Stewart et al., 2008; Wensier et al., 1992), hyperlipidaemia (Dattilo & Kris-Etherton, 1992; Stewart et al., 2008), psychological problems (Blaine, Rodman, & Newman, 2007; Stewart et al., 2008), and mortality (Williamson et al., 2000; Stewart et al., 2008). For example, modest intentional weight loss has been shown to reduce mortality by 25% to 50%, and

this reduced mortality is most apparent in overweight individuals with diabetes (Williamson et al., 2000). Furthermore, encouraging findings for people with diabetes suggest weight loss along with proper diabetes management can lead to clinical remission (Fowler, 2007). Thus, for overweight people with T2DM, weight loss via diet and PA is recommended (ADA, 2007b; Fowler, 2007).

Depression Aetiology and Risk Factors

Similar to T2DM and overweight, the aetiology and risk factors of depression are complex and multi-factorial, involving a combination of environmental, lifestyle (e.g., physical inactivity), psycho-social, and biological factors (Kemp et al., 2005; Siegal, Yancey, & McCarthy, 2000; United States Department of Health and Human Services [USDHHS], 1999). Furthermore, the cause/s of depression differ for each individual (USDHHS, 1999). Nevertheless, although there are numerous psychosocial, biological, and medical risk factors for depression, there are three main, consistently demonstrated risk factors for depression that are particularly relevant for overweight women with T2DM: physical inactivity (Cassidy et al., 2004; Darren, Warburton, Whitney, & Shannon, 2006; WHO, 2010b), overweight, and chronic illnesses, such as T2DM and CHD (AIHW, 2005; Siegal et al., 2000).

Depression Associated Health Problems and Burden

The individual and societal health and economic burden of depression across the severity spectrum (DS and CD) is substantial. For example, as mentioned, depression is a major, independent risk-factor for health problems, such as T2DM (Adriannse, Dekker, & Nijpels, 2006; Brown, Majumdar, Newman, & Johnson, 2005; Carnethon, Kinder, Fair, Stafford, & Fortmann, 2003; Eaton, Armenian, Gallo, Pratt, & Ford, 1996; Golden et al., 2004), weight gain and overweight (ABS, 2006a; Katon et al., 2003; Stice,

Pressnell, Shaw, & Rohde, 2005; Stunkard, Faith, & Allison, 2003), myocardial infarction (Black, 1999), coronary artery disease (CAD; Lett et al., 2004), ischameic heart disease, cerebrovascular disease, cancer, and rheumatoid arthritis (AIHW, 2006). Depression is also associated with diminished capacity and function (Williams, Clouse, & Lustman, 2006), and increases mortality risk (Kamphuis et al., 2007; Williams et al., 2006). In Australia, mental health problems are the third leading contributor of disease burden, after cancers and cardiovascular disease (CVD; AIHW, 2010), and the leading contributor of non-fatal disease burden, accounting for nearly a quarter (24%) of the total disability burden for all diseases (AIHW, 2010). Consequently, mental health, particularly depression, has been labelled one of Australia's seven NHPA's (AIHW, 2005).

The combination of depression and T2DM results in worse health, economic, and mortality risk outcomes than either health problem alone, particularly for people who are overweight and engage in low levels of PA (Kamphius et al., 2007; Katon et al., 2003; Lustman & Clouse, 2002; McCollum, Ellis, Regensteiner, Zhang, & Sullivan, 2007). For example, outcomes from one study suggested that people with depression (determined by the Patient Health Questionnaire [PHQ]) and diabetes are twice as likely to have three or more CVD risk factors than people with diabetes and no depression (Katon et al., 2003). In people with T2DM, depression can have direct and indirect negative impacts on effective diabetes management, for example, by lowering glycemic control (Lawrence et al., 2006; Lustman & Clouse, 2005; Williams et al., 2006), and enhancing the progression and severity of diabetic complications (De Groot et al., 2001; Lin et al., 2010; Lustman & Clouse, 2002; Williams et al., 2006). Additionally, compared to individuals with one or none of these conditions, people with both diabetes and depression have a lowered health-related quality of life (QOL; Maddigan, Feeny, Majumdar, Farris, & Johnson., 2006), diminished functional and work disability

(McCollum et al., 2007; Ryerson et al., 2003; Von Korff et al., 2005), and decreased ability to carry out daily living activities (Black, 1999; McCollum et al., 2007). Furthermore, people with diabetes and depression are less likely to lose weight (Ludman et al., 2010), and are less likely to adhere to diabetes management regimens (McCollum et al., 2007), such as regular PA (Piette, Richardson, & Valenstein, 2004). This is particularly problematic for overweight women with T2DM, because women and overweight people are more likely to report inactivity/low levels of PA than men and normal weight individuals (respectively; ABS, 2009). Thus, overweight women with T2DM and depression can be considered a particularly high risk population for inactivity. The problem of inactivity is discussed in the *Physical Inactivity* section of this chapter. Not surprisingly, people with diabetes and depression typically have longer hospital stays than individuals with only one of these conditions (Finkelstein et al., 2003). Moreover, the presence of depression and diabetes also translates into significant economic burden for the individual (Egede, Zheng, & Simpson, 2002) and society (Williams et al., 2006). For example, Egede et al. found that total health care expenditure for adults with diabetes and depression is 4.5 times higher than for individuals without depression (Egede et al., 2002). Clearly, reducing depression, particularly among people with one or more chronic conditions, such as T2DM and overweight, would have a far-reaching beneficial impact.

Examining the Depression and Type 2 Diabetes Mellitus Co-Morbidity

In this section, I demonstrate the multi-directional, and complex association between depression and T2DM. To reiterate, because the majority of people with T2DM are overweight, a separate discussion of the depression and overweight co-morbidity is not provided (see Appendix Table D2.7 however for study outcomes examining the prevalence of the depression and overweight co-morbidity). Where available, BMI

status is provided for the participants in the studies discussed in this section. Furthermore, because the definition of depression has varied between studies, the term depression in this review is related to the way it has been defined in each of the studies discussed.

Over the last 20 years, the relationship between depression and T2DM has received considerable research attention. Although the underlying mechanisms of this relationship are not fully understood (Musselman, Betan, Larsen, & Phillips, 2003), the high prevalence of depression in people with T2DM is apparent (Ali et al., 2006). For example, outcomes from a meta-analysis by Ali et al. suggested that people with T2DM are nearly twice as likely to experience depression (assessed using self-report measures, or diagnostic interview) compared to those without T2DM (17.6% vs. 9.8% respectively). The high prevalence of depression among people with T2DM is consistent with findings from research examining depression in people with other medical illnesses including CHD (Carney, Freedland, Sheline, & Weiss, 1997), cancer (Bottomly, 1998), and CAD (Frasure-Smith & Lesperance, 2000). Additionally, the experiencing of DS appears more prevalent than clinically diagnosed depression. For example, outcomes from one meta-analysis showed that, in people with Type 1 and T2DM, elevated DS was nearly twice as prevalent as CD (31% of men and women vs. 11.4% of men and 17.6% of women, respectively; Anderson et al., 2001). The causality or temporality of this association however cannot be determined by prevalence statistics, and whether depression precedes or follows a diagnosis of T2DM is a debated research topic (Golden et al., 2008; Knol et al., 2006; Lustman & Clouse, 2007; Mezuk, Eaton, Albrecht, & Golden. 2008; Talbot & Noewen, 2000). Evidence for both temporal directions exists, demonstrating the complexity of this relationship.

Depression as a Risk Factor for T2DM

The possibility of depression causing diabetes was first indicated over three centuries ago in 1684 by physician and anatomist Thomas Willis, who suggested diabetes was the result of "sadness, or long sorrow" (Willis, 1684; as cited in Rubin & Peyrot, 2002). It was not until the mid 1980's, however, that researchers began to examine this relationship. During this time, outcomes from several prospective studies with follow-up periods of 6 years (Golden et al., 2004), 8 years (Kawakami et al., 1999; Palinkas et al., 2004), 13 years (Eaton et al., 1996), and 20 years (Carnethon et al., 2003) provided considerable evidence that experiencing symptoms of depression (Adriannse et al., 2006; Carnethon et al., 2003; Golden et al., 2004; Kawakami et al., 1999; Palinkas et al., 2004), and clinically diagnosed depression (Brown et al., 2005; Eaton et al., 1996; Musselman et al., 2003; Nichols & Brown, 2003) increase the risk of T2DM. For example, in a 60-year prospective study involving 11, 615 initially non-diabetic adults aged 48-67 years, Golden et al. reported that those who had a high level of DS (assessed using the 21-item Vital Exhaustion questionnaire) at baseline had a 66% increased risk of developing diabetes compared to individuals with a low level of DS at baseline. This increased risk was independent of several demographic, metabolic, and lifestyle factors (e.g., diet, bodyweight, PA level). Similarly, in a 20-year prospective study involving 6, 190 initially non-diabetic American men and women aged 25-74 years (who took part in the first National Health and Nutrition Examination Survey conducted between 1971-1992), Carnethon et al. reported that the incidence of diabetes at follow-up was greater among individuals with a high level of DS compared to those without DS at baseline. Furthermore, only 37% of the association between DS and diabetes could be explained by health behaviours (e.g., diet, PA) and baseline bodyweight.

Meta-analysis outcomes provide further evidence of the adverse impact of depression on the development of T2DM (Knol et al., 2006; Mezuk et al., 2008). For example, the meta-analysis by Mezuk et al. included 13 studies investigating the bi-directional prospective relationships between depression (mainly assessed using self-report measures) and T2DM. Findings revealed that depression was associated with a 60% increased risk of T2DM, whereas T2DM was associated with only modest (15%) increased risk of depression (Mezuk et al., 2008).

Research in the present thesis is not focused on investigating the underlying reasons for the adverse effect of depression on T2DM. Nevertheless, it should be noted that it appears that there is no single mechanism. For example, depression has been shown to increase the risk of developing T2DM, both directly (Kawakami et al., 1999; Golden et al., 2004), and indirectly via the influence of depression on poor dietary habits and sedentary behaviour (ABS, 2006a; Eaton, 2002). Additionally, there may be somatic aspects of depression (e.g., changes in immune or vascular system), and neuroendocrine changes associated with depression (Evans, 2006), that can increase the risk of diabetes (Herbert & Cohen, 1993), and further facilitate the negative cycle between depression and T2DM (Eaton, 2002). Regardless of the underlying mechanism, the majority of research outcomes show depression to be a significant and independent risk factor for the development of T2DM. Moreover, the independent effect of DS on diabetes risk has been found to be comparable in size to other T2DM risk factors, namely smoking and physical inactivity (Eliasson, 2003; Hu et al., 2001; Knol et al., 2006).

Depression as a Consequence of T2DM

There are few qualitative studies (Penckofer, Ferrans, Velsor-Friedrich, & Savoy, 2007), quantitative studies (Knol, 2007; Talbot, Nouwen, Gingras, Belanger, & Audet, 1999), and research reviews (Talbot & Nouwen, 2000) that have examined depression as a consequence of T2DM. Research that has been published however, has shown lifestyle demands and limits imposed by T2DM (e.g., strict diet, regular PA, glucose monitoring) can bring about depression and intensify already existing depression (across the symptom severity range; Harris, 2003; Koopmanschap, 2002; Talbot & Nouwen, 2000). Also, T2DM may cause biochemical changes that can reduce an individual's QOL, consistent with the notion that T2DM leads to depression (Eaton, 2002).

In people with diabetes, depression (across the severity spectrum) seems to be particularly influenced by associated health complications, rather than the actual diagnosis of diabetes. This indication is based on findings from research investigating symptoms of depression (Engum, Mykletun, Midthjell, Holen, & Dahl, 2005; Katon, et al., 2004; Knol et al., 2007; Leedom, Meehan, Procci, & Zeidler, 1991; Lloyd, Dyert, & Barnett, 2000; Peyrot & Rubin, 1999; Talbot et al., 1999), clinically diagnosed depression (Brown, Majumdar, Newman, & Johnson, 2006; Pouwer et al., 2010), and meta-analysis outcomes involving research that has examined either DS or CD (De Groot et al., 2001). For example, Engum et al. conducted a large, population-based study investigating factors associated with DS (assessed using a HADS-D score ≥8) in people aged 20 to 89 years with Type 1 Diabetes (*n* = 223; mean BMI = 27.2; 62.5% physically inactive), T2DM (*n* = 958; mean BMI = 29.6; 65.2% physically inactive), or without diabetes (*n* = 59, 329; mean BMI: 26.2; 61.8% physically inactive) residing in Nord-Trøndelag County, Norway. Individuals with Type 1 and T2DM were more likely

to report elevated DS than people without diabetes: 15.2% and 19.0% vs. 10.7%, respectively. The findings of Engum et al. also revealed that physical inactivity was associated with DS for individuals with T2DM. Additionally, people with T2DM without co-morbidity (e.g., cardiovascular diseases) had the same risk of DS as people without diabetes or any reported chronic somatic diseases. Further evidence of the negative influence of diabetes-associated health problems on depression risk comes from a study by Lloyd et al., which involved 109 adults aged 18 years or older with Type 1 or T2DM, recruited from a diabetes clinic in the United Kingdom. Outcomes revealed that only those who had a history of diabetes complications (e.g., retinopathy, CAD) reported a mild DS level (8%; indicated by a HADS-D score of 8-10) or moderate to severe DS level (17%; HADS-D score $\geq$11). Furthermore, Leedom et al. examined the prevalence of DS (using the BDI) in 71 people aged 30 to 70 years with T2DM from an outpatient diabetes clinic in Los Angeles. According to results, people with T2DM and complications (e.g., neuropathy, retinopathy) were significantly more likely to indicate at least mild DS (BDI score > 9) compared to people with T2DM and no complications, and individuals without diabetes (74% vs. 30% vs. 21.7%. respectively). Furthermore, among those with complications, 20% indicated moderate DS (BDI score of 16-23), and 35.5% reported severe DS (BDI score $\geq$ 24). In comparison, 7.5% of people with T2DM and no complications, and only 4.3% of people without diabetes, were considered to have a moderate level of DS, and no participants in these other two groups reported a severe level of DS.

In summary, previous research findings suggest a high prevalence of depression (DS and CD) in people with T2DM, and the temporal order may be from depression to diabetes, and/or from diabetes to depression. Furthermore, the presence of diabetes-related health problems, rather than a diagnosis of T2DM per se, appears to increase the

risk of depression among people with T2DM. This is an important finding for overweight people with T2DM, particularly if they are physical inactive, because these individuals have an increased likelihood of experiencing additional health problems.

Reducing depression in people with T2DM. Reducing depression in people with T2DM, especially those who are overweight, has far-reaching health and economic benefits, for people with depression and T2DM and for society at large. Consequently, the identification and treatment of depression (across the severity spectrum) is considered an important element of effective diabetes management, in particular for maximising treatment adherence (ADA, 2006). For example, reducing depression can assist with optimising self-care behaviours, like regular PA (ADA, 2006; McCollum, Ellis, Regensteiner, Zhang, & Sullivan, 2007), and weight loss (Ludman et al., 2010). Unfortunately, however, CD is only recognised and treated in one-third of people with diabetes (Egede, 2005; Lustman & Clouse, 2005; Rubin, Ciechanowski, Egede, Lin, & Lustman, 2004). It is likely that even more cases of DS go unrecognised, and thus untreated. Therefore, effective interventions to prevent or reduce symptoms of depression among people with T2DM need to be identified and implemented. The type of intervention treatment that will be most effective in the reduction of depression in people with T2DM is important when considering the impact on glycaemic control. For example, reducing symptoms of depression via pharmaceutical agents might not be a preferred treatment option, because pharmacological agents can have an adverse effect on glycaemic control (Harris, 2003; Lustman et al., 1997; Petrak & Herpertz, 2009). Psychotherapy can reduce depression, but has no direct impact on T2DM (Petrak & Herpertz, 2009). Researchers are yet to develop an optimal treatment for reducing DS among people with diabetes (Ismail, Winkley, & Rabe-Hesketh, 2004; Petrak & Herpertz, 2009; Williams et al., 2006). An optimal treatment might be considered to be

one that benefits both chronic illnesses: depression and diabetes (Lustman & Clouse, 2002). Thus, psychological interventions encouraging PA participation and adherence could be effective, particularly for people who are also overweight, because these interventions are likely to have a three-tiered effect, reducing symptoms of depression (Dubbert, 2002), assisting with weight loss (Jakicic et al., 2001), and improving diabetic outcomes (ADA, 2007b); without the possible complications of medication (Harris, 2003; Petrak & Herpertz, 2009). Health benefits of PA are discussed in the *Physical Activity* section of this chapter.

T2DM, Overweight, Depression, and Female Gender

Contemporary research findings have typically shown a gender difference in the prevalence of depression among adults with T2DM (Anderson et al., 2001; Ali et al., 2006; Collins, Corcorant, & Perry, 2009; Goldney, Philips, Fisher, & Wilson, 2004; Pouwer & Snoek, 2001; Pouwer et al., 2010; Roupa et al., 2009; Sotiropolous et al, 2008) and/or adults who are overweight (Atlantis & Baker, 2008; Carpenter, Hasin, Allison, & Faith, 2000; Heo, Peitrobelli, Fontaine, Sirey, & Faith, 2006; Johnston, Johnson, McLeod, & Johnston, 2004; Simon et al., 2006; Scott, McGee, Wells, & Browne, 2008; Zhao et al., 2009). For example, outcomes from the meta-analysis by Andersen et al. showed more women (28%) than men (18%) with Type 1 or T2DM reported depression (based on clinical interviews and self-report measures). Roupa et al. examined DS (assessed using a HADS-D score ≥ 8) among 310 men and women from Greece (56% female) aged 20 years or more with T2DM. Findings showed that 17.8% of men and 41.4% of women reported at least a mild level of DS. Moreover, among women, DS risk increased 4% with every one BMI unit increase (Roupa et al., 2009). Similarly, Sotiropolous et al. examined the prevalence of elevated DS (using a version of the BDI that was modified for use in diabetic participants, and indicated elevated by a

score of ≥ 19) in 320 men and women out-patients from Greece, aged 35 to 70 years, with T2DM (without overt macrovascular disease). Overall, 33.4% of the participants reported elevated DS, although women were significantly more likely than men to report DS (48.4% vs. 12.7% respectively). Further evidence comes from Pouwer and Snoek's study involving men and women with T2DM who were either out-patients with diabetes (*n* = 84) or patient members of the Dutch Diabetes Association (DDA); *n* = 700). In both groups, more women than men reported moderate-severe DS (HADS-D score ≥ 11; 12% vs. 9% in the out-patients, and 10% vs. 4% in the DDA participants; Pouwer & Snoek, 2001).

Research outcomes involving overweight and obese populations show similar gender disparities. For example, Johnston et al. (2004) examined data from 2, 431 Canadian adults aged 18 years or more who took part in the 1995 Nova Scotia Health Survey. Results showed that women (in all age and BMI weight categories, with the exception of those over 65 years of age in the "acceptable" weight category) were more likely to report higher DS (measured using the CES-DS) than men (mean score for all women and men: 8.2 vs. 6.7; Johnston et al., 2004). Furthermore, Scott et al. (2008) conducted cross-sectional general population surveys in 13 countries to investigate the association between obesity and mental disorders (assessed with the CIDI). Results from their pooled analyses showed statistically significant associations between obesity and depression (and anxiety) disorders among women, but not men. This gender disparity corresponds with outcomes from similar research involving people from the general population, and those with chronic conditions like CHD (Litchman et al., 2008) and CVD (Pilote et al., 2007), and across many nations, cultures, and ethnicities (Nolen-Hoeksema, 2001). The size of this difference (and absolute percentages of depression in women and men), and processes contributing to the gender difference in depression is

likely to differ across cultures and ethnicities (Nolem-Hoeksema, 2001; Scott et al., 2008). See Appendix B (Table B2.5) for world-wide prevalence of depression (CD and DS) in overweight population, general population, people with diabetes, and physically inactive people; and Appendix C (Table C2.6) for equivalent Australian prevalence statistics. Also, Tables presented in Appendix D (Table D2.7) and Appendix E (Table E2.8) show outcomes from studies conducted across the globe, which examined depression prevalence in people who are overweight, and those with T2DM, respectively. Gender disparities are specifically noted in these Tables. The consistent gender difference in the reporting of depression (CD and DS) that has been found in research using a range of depression measures (e.g., clinical interview to self-report measures) and in a variety of populations underscores the high risk and prevalence of depression, particularly DS, for women with T2DM and/or overweight.

In summary, findings to date show T2DM, overweight, and depression are three chronic health problems with strong inter-linked associations, and that these associations are far from simple. Two key factors from existing research are clear: Overweight women with T2DM have a high risk of depression; and, people with one or more of these conditions, especially women, are less likely to engage in PA. Therefore, overweight women with T2DM and depression is a population in particular need of an effective intervention to prevent and reduce symptoms of depression, and enhance PA participation.

Physical Activity

In this section, I elaborate on some of the numerous health benefits of regular PA. It is beyond the scope of this review to discuss the vast amount of existing research that has examined the physical and psychological benefits of PA. For the purpose of the present thesis, I briefly highlight commonly reported physical health benefits of regular PA. Then, because this thesis is concerned with the psychological benefits of PA, a more detailed discussion on the psychological benefits of PA is provided.

Types of Physical Activity that Lead to Health Benefits

The wide range of physical and psychological health benefits can be achieved via participation in all types of PA, including structured continuous bouts of aerobic exercise (Bernstein, Costanza, & Morabia, 2004; Blumenthal, Williams, Needels, & Wallace, 1982; Turk et al., 2006), intermittent exercise (Jakicic & Otto, 2005), resistance training (Penninx et al., 2002; Perna et al.,1999; Singh, Clements, & Singh, 2001; Vincent , Braith, & Vincent, 2006), and yoga and flexibility exercises (Tudor-Locke, Bell, & Meyers, 2000). Moreover, health benefits can be achieved from accumulated short bouts of exercise and lifestyle PA (Andersen, Wadden, Barlett, Zemel, & Verde, 1999; Daley & Welch, 2004; Dunn et al., 1999; Murphy, Nevill, Nevill, Biddle, & Hardman, 2002; Pratt, 1999). Therefore, consistent with the AL concept, individuals can meet the minimum recommended PA level (see Table 2.1) and receive the associated health benefits, by engaging in the type/s of PA that suit their needs and preference.

Physical Health Benefits

There is strong evidence that regular PA has many physical health benefits. Additionally, a graded linear relationship exists, with more PA leading to a lower risk of

health problems, and maximum health benefits compared to less PA (Warburton, Nicol, & Bredin, 2006; USDHHS, 1996). An encouraging finding for sedentary people wanting to become more physically active is that the greatest health improvements are seen when people who are unfit become physically active (Bauman, 2003; Darren et al., 2006). In terms of health benefits, regular PA can assist with the primary and secondary prevention of several chronic diseases, including, stroke, cancer (particularly colon, breast, and endometrial), heart and pulmonary diseases (chronic obstructive pulmonary disease, CHD, chronic heart failure), muscle, bone, and joint diseases (osteoporosis, osteoarthritis, rheumatoid arthritis, fibromyalgia, intermittent claudication) and chronic fatigue syndrome (Fletcher et al., 1996; Pate et al., 1995; Whiting et al., 2001). Protective health benefits (e.g., CVD and T2DM prevention) have been noted after as little as 15 minutes of moderate-intensity PA per day, and 60 min per week (Brown, Burton, & Rowan, 2007).

Regular PA also plays a key role in weight loss (Brownell & Wadden, 1992; Jakicic & Otto, 2006; Gwinup, 1975; Pi-Sunyer et al., 1998; Wing & Hill, 2001) and weight maintenance (Fabricatore & Wadden, 2003; McGuire, Wing, Klem, Lang, & Hill, 1999; Lohman & Wright, 2004). Living a physically active lifestyle is also associated with a 40% reduction in the genetic predisposition to obesity (Li et al., 2010). Additionally, research has demonstrated the key role of PA in T2DM prevention (Franz, 2007; Pi-Sunyer, 2007; Timo & Laaksonen, 2007) and management (Boule Haddad, Kenny, Wells, & Sigal, 2001; Praet et al., 2006), independent of weight loss (Bauman, 2003; Boule et al., 2001; Jeon, Lokken, Hu, & Van Dam, 2007; Sherwin et al., 2004; Sigal, Kenny, Wasserman, Castaneda-Sceppa, & White, 2006). With reference to T2DM management, reductions in blood glucose have been noted across a wide range of PA intensities (Cayley, 2007). For example, regular moderate-intensity PA can reduce blood glucose levels by 0.6% (Boule et al., 2001), and even low-intensity

lifestyle PA can have beneficial effects on 2-hour plasma glucose (a marker of glucose control; Healy et al., 2007).

Regular PA can also improve cognitive functioning, particularly later on in life (Fratiglioni, Paillard-Borg, & Wimblad, 2004) and may have a protective effect against dementia and Alzheimer's disease (Fratiglioni et al., 2004). Not surprisingly, regular PA is associated with a reduced risk of premature death from all cause (ACM) and cardiovascular disease (CVDM; Darren et al., 2006; Gregg, Gerzoff, Casperen, Williamson, & Narayan, 2003; Lee & Skerret, 2001). For example, regularly active people have around a 30% reduced risk of ACM than those who are inactive (Lee & Skerret, 2001), and for people with T2DM, even 2 hours per week of walking has been shown to reduce ACM risk by 39%, and lower CVDM by 34% (Gregg, et al., 2003). Therefore people with T2DM, especially those who are overweight, should be encouraged to participate in regular PA. Moreover, for sedentary individuals, or people with multiple health problems (e.g., T2DM and overweight), encouraging at least low-intensity lifestyle PA, and emphasising that some PA is better than none, may have a higher success rate than traditional pre-determined structured exercise regimens, at least initially, in helping these individuals to adopt and maintain PA.

It is important to note that regular PA will only produce the desired health benefits as long as people regularly continue to participate (Praet & van Loon, 2008; Woodard & Berry, 2001). Therefore, to experience and sustain health benefits, adherence to regular PA is just as important as initially increasing PA participation. For example, findings from one study suggested that the favourable changes in glucose tolerance and insulin sensitivity usually diminish within 72 hours of participants' last exercise session (Albright et al., 2000). Other study outcomes suggest a less conservative time frame, with the health benefits diminishing within 3 to 10 days of

inactivity (Martinus, Corban, Wacherhage, Atkins, & Singh, 2006), and disappearing within 2 to 8 months if PA participation is not recommenced (USDHHS, 1996). Further support for the importance of PA adherence comes from Wing and Hill's (2001) review of the National Weight Control Registry in the USA. Specifically, they determined the main factors needed for successful weight loss maintenance (defined as achieving long-term [at least one year] maintenance of intentional weight loss of 10% of initial bodyweight). According to their findings, in addition to a calorie controlled diet and self-monitoring of weight, an essential component is 60 minutes of daily moderate-intensity PA (e.g., brisk walking). Unfortunately however, only around 20% of overweight individuals are able to maintain their weight loss for at least one year (Wing & Phelan, 2005). Given the high prevalence of inactivity among people who are overweight, particularly women, it is likely that poor PA adherence has contributed to the low success rate of weight loss maintenance among overweight individuals. The problem of poor adherence to PA is discussed in the *Physical Inactivity* section of this chapter. Clearly, there is a need for the identification and implementation of psychological interventions aimed at increasing PA participation and, importantly, adherence among overweight women with T2DM and depression.

Physical health benefits independent of weight change. The importance of encouraging even small increases in PA among overweight individuals is underscored by the finding that health benefits of higher levels of aerobic fitness (an outcome of regular PA) have been demonstrated in overweight men and women (Bernstein et al., 2004; Hainer, Toplak, & Stich, 2009; King, Hopkins, Caudwell, Stubbs, & Blundell, 2009), and morbidly obese adults (Bernstein et al., 2004; Jakicic & Otto, 2006; Vincent et al., 2006). Additionally, these health benefits have been shown to counteract the negative influence of excess body weight on health outcomes (Blair & Brodney, 1999; Hainer et al., 2009; Healy, Dunstan, Shaw, Zimmet, & Owen, 2006; Jacikik & Otto,

2005). For example, Healy et al. (2006) examined the benefits of PA for overweight adults with T2DM and found PA attenuated the risk of having high blood glucose associated with overweight. Moreover, based on a review of 24 prospective observational studies, Blair and Brodney concluded fit and active overweight individuals are less likely to develop obesity-related chronic diseases and have a premature death than sedentary normal weight individuals (Blair & Brodney, 1999). This outcome was reiterated in a recent systematic review (Fogelholm, 2009). Although overweight individuals can achieve health benefits from PA, it should be noted that overweight people, even those who participate in high levels of PA are still at greater risk of CV and diabetes risk factors than normal weight individuals who engage in low levels of PA (Fogelholm, 2009). Therefore, although regular PA has independent health benefits, weight loss should still be a health priority among overweight people with T2DM.

Psychological Health Benefits

The psychological benefits of PA have been recognised for over a century (Franz & Hamilton, 1905). It was not until the 1990's, however, that research examining these benefits began to accrue. Therefore, existing literature on the psychological benefits of PA is not as extensive as the plentiful research examining physical health benefits. Nevertheless, since the 1990's, substantial and accumulating evidence has demonstrated a relationship between regular PA and improved psychological health, such as enhanced mood, well-being, and QOL, and reduced anxiety, depression, and stress (Fox, 1999; Plante & Rodin, 1990). Consequently, in 1996, exercise was acknowledged by the Surgeon General's Report to be an effective intervention for depression and anxiety (Dubbert, 2002; USDHHS, 1996). Psychological benefits of PA have been demonstrated among people in the general

population (Albright et al., 2000; Blumenthal et al., 1982; Daley & Welch, 2004; Fontaine et al., 1999; Hamer, Stamatkis, & Steptoe, 2009; King, Taylor, & Haskell, 1993; Phillips et al., 2003; Thogersen-Ntoumani, Fox, & Ntoumanis, 2005), previously sedentary adults (Ball, Burton, & Wendy, 2008; Fox, 1999; Murphy et al., 2002), and people who are overweight or obese (Berger, 2004; Hayes & Ross, 1986; Perna et al., 1999). Psychological benefits of PA have also been demonstrated among people with other chronic illnesses, such as T2DM (Honkola, Forsen, & Eriksson, 1997; Kirk et al., 2001; Martinus et al., 2006), CVD (Beniamini, Rubenstein, Zaichkowsky, & Crim, 1997; Dugmore et al., 1999; Ewart, 1989), multiple sclerosis (Petajan et al., 1996), CHD (Rogerson, 2009), and knee osteoarthritis (Penninx et al., 2002). Furthermore, psychological benefits of PA have been demonstrated in individuals with clinically diagnosed depression (Babyak et al., 2000; Blumenthal et al., 1999; Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005; Fox, 1999; Paluska & Schwenk, 2000; Pedersen & Saltin, 2006; Phillips, Kiernan, & King, 2003; Richardson et al., 2005; Salmon, 2001; Schomer & Drake, 2001).

General population. The positive effects of exercise on psychological health among adults from the general population are well established (Blake, Mo, Malik, & Thomas, 2009; Paluska & Schwenk, 2000). Mood benefits are noticeable after a single session of exercise (Roth, Bachter, & Fillingim, 1990), even following short bouts (e.g., 15 minutes) and longer bouts (e.g., 30 minutes) of activity, and these effects can be sustained for up to 2 hours (Daley & Welch, 2004). Moreover, in a study involving nearly 20, 000 men and women, Hamer et al. (2009) found a dose-response relationship between PA and psychological distress, with higher levels of PA leading to greater psychological benefits. Even as little as 20 minutes of weekly self-report PA (including lifestyle PA, walking, and sport activities) resulted in lower levels of psychological

distress (measured using the General Health Questionnaire-12; Goldney & Williams, 1988). In particular, according to their findings, Hamer et al. reported that participating in domestic PA (e.g., housework, gardening) and walking is associated with a 13% to 20% reduced risk in psychological distress, and sport is associated with an approximately 33% reduced risk (Hamer et al., 2009). This is a positive finding for sedentary individuals with depression wanting to become more active and attain the psychological benefits of PA, yet who are unable to engage in high levels of PA, at least in the initial stages of fitness improvement. Similarly, in a 3-year prospective study involving 6,677 women aged 22 to 27 years at baseline, participating in the Australian Longitudinal Study on Women's Health, Ball, Burton, and Wendy (2008) found that compared to sedentary women at baseline, physically active women at baseline had a lower risk of developing depression (assessed using the CES-D-10 short form; Andresen, Malmgren, Carter, & Patrick, 1994) at follow up. Additionally, sedentary women who increased their PA during the 3 year follow-up had a lower risk of depression at follow-up than those who remained sedentary, independent of weight status. Therefore, it is apparent that people without a clinical diagnosis of depression can achieve psychological benefits from all types of PA. Furthermore, like physical health benefits, when participation is maintained, psychological benefits persist over the long term (Anderson et al., 2009; Blumenthal et al., 1982; Fontaine et al., 1999; Fox, 1999; Murphy et al., 2002; Plante & Rodin, 1990).

Clinical depression population. Outcomes from numerous studies (e.g., Moore et al., 1999), including well-designed, randomised control trials (RCT; e.g., Blumenthal et al., 1999; Singh, Clements, & Singh, 2001) have shown that for CD treatment, regular exercise (independent of increases in aerobic fitness) is as efficacious as a standard pharmaceutical treatment (Brosse, Sheets, Lett, & Blumenthal, 2002; Lawlor

& Hopker, 2001). For example, one RCT with a 20-month follow-up found that 20 weeks of progressive RT had resolved CD (measured using the BDI) in 73% of people in the exercise group compared with 36% of people in the control group (Singh et al., 2001). Similarly, in a study by Dunn et al. (2005), the antidepressant effects of PA (at a dose consistent with the recommended amount for physical health benefits; see Table 2.1) among people with mild to moderate MDD, were comparable to those reported in trials of other depression treatments, including cognitive behavioural therapy (CBT) and antidepressant medication (Dunn et al., 2005). Consequently, PA is considered to be an important adjunct, or substitute, to other widely used pharmacological and psychological therapies for the treatment of depressive disorders (Hardie, 2005; Paluska & Schwenk, 2000; Schomer & Drake, 2001). Additionally, for the prevention and treatment of depression, health practitioners recommend that PA should no longer be seen as a possible treatment option, but rather, an essential component of "best practice" in medicine (McPhail, 2006).

Psychological health benefits independent of weight change. Similar to physical health benefits, the psychological benefits of PA can be experienced independent of weight change or fitness improvement (King, Hopkins, Caudwell, Stubbs, & Blundell, 2009; Perna et al., 1999). For example, Perna et al. examined whether the psychological benefits (measured using the short form of the Medical Outcomes Study Health Status Questionnaire; Wu et al, 1991) of exercise could offset the negative impact of dieting among 22 sedentary, obese adults. Participants were randomly assigned to one of three groups: diet and aerobic exercise, diet and RT, or a wait-list control condition. At 12-week follow-up, compared to the control group, people in either of the two exercise groups achieved significant improvement in mental health, QOL, perceived health, fitness, and significant weight reduction. Importantly, the

psychological benefits were unrelated to changes in weight and fitness (Perna et al., 1999). Further support comes from 12-week outcomes of a supervised aerobic exercise intervention (70% maximum heart rate; approx. 500 kcal per session; 5 times a week) conducted by King et al. (2009). Specifically, 58 initially sedentary overweight (BMI≥ 25) men and women took part in the intervention, and various physical (body composition, anthrometric parameters), physiological (aerobic capacity, blood pressure) and psychological (assessed using the Positive and Negative Affect Scale; Watson, Clark, & Tellegen, 1998) measures were taken at baseline and post-intervention. Post-intervention results showed that the mean reduction in body weight was 3.6kg, however, 26 participants did not attain the predicted weight loss estimated from their exercise-induced energy expenditure (their mean weight loss was 1.8kg). Nevertheless, despite attaining lower than predicted weight reduction, these participants still experienced significant health improvement in other markers of health, including increased aerobic capacity, reductions in waist circumference measures, reduced blood pressure, and positive mood. Importantly, there were no significant differences in these health benefits between participants who did and did not achieve the predicted weight loss (King et al., 2009). Therefore, these findings highlight the importance of promoting PA for health benefits other than weight loss (e.g., physiological and psychological benefits), particularly among overweight individuals who, at least initially, are unlikely to achieve significant weight loss, yet, are likely to experience other physical and psychological health benefits. This assertion is consistent with Blair and Church's (2003) proposal that diabetes specialists should encourage their patients with T2DM to engage in exercise for the numerous health benefits of PA (e.g., reduced risk of CVD and mortality, enhanced psychological well-being), rather than as a tool primarily for weight loss (Blair & Church, 2003).

Existing knowledge regarding the psychological benefits of PA is based on outcomes from studies that have involved a variety of self-report and interview based measures to define depression. This demonstrates the robustness of PA for treatment of depression (across the severity spectrum; Paluska & Schwenk, 2000). Unfortunately however, despite the known psychological benefits, PA is not widely utilised by mental health professionals as a primary or adjunct method for treating depression (Faulkner & Biddle, 2001). Furthermore, as discussed in the *Physical Inactivity* section of this chapter, physical inactivity continues to challenge Australia's public health sector among people with depression, females, people who are overweight, and those with chronic illnesses like T2DM. Therefore, effective interventions are needed to increase regular PA participation as a way of preventing and/or reducing depression (DS and CD), in high risk populations for inactivity and depression, such as overweight women with T2DM.

Mechanisms underlying the psychological benefits of physical activity. Several different mechanisms have been proposed to explain the psychological benefits of PA. Examples of possible mechanisms include social (e.g., social support; King et al., 1993; Singh et al., 2001) psychological (King et al.,1993), physiological (e.g., increased cardiovascular fitness; King et al., 1993; Phillips et al., 2003), and biological (Dunn & Dishman, 1991; Dunn, Trivedi, O'Neal, 2001) mechanisms. Research outcomes also indicate that factors associated with the process of PA (Berger, 2004), rather than the physiological adaptations that accrue from participating in regular PA, may be more likely to lead to enhanced psychological well-being (Fox, 1999; McAuley, & Morris, 2007). Although a detailed discussion of each proposed mechanism is beyond the scope of this review, it is unlikely that one single mechanism can explain the resultant psychological benefits of PA. Rather, evidence suggests that the underlying

mechanisms are multi-factorial in any situation (Fox, 1999; Salmon, 2001). For example, psychological benefits of PA may be the result of a combination of factors relating to the characteristics of the PA (e.g., intensity, duration), characteristics of the individual, and environmental factors surrounding the PA (Fox, 1999). Regardless of the underlying mechanisms however, PA is a no-or low-cost mode of preventing and reducing depression.

Physical Activity Recommendations

It is clear that PA provides significant physical and psychological health benefits. Presented in Table 2.1 are the current PA recommendations for health benefits, weight loss and weight maintenance, T2DM prevention and maintenance, and for psychological benefits.

Table 2.1

Physical Activity (PA) Recommendations

Objective	PA Recommendation	Source and Supporting evidence
Health benefits	Accumulation of at least 30 min of moderate-intensity* PA on most, preferably all days of the week, or at least 90 minutes a week of vigorous aerobic exercise.	Pate et al., 1995; The Australian Government Department of Health and Ageing, 2005. **Supporting evidence:** Dubbert, 2002; Keim, Blanton, & Kretsch, 2004; Lee, Sesso, Oguma, Paffenbager, 2003.
Weight loss and weight maintenance	Weight loss: accumulation of at least 60-90mins of moderate-intensity* PA on most, and preferably all, days of the week; Weight maintenance: accumulation of approximately 60 minutes per day of moderate-intensity PA.	Jakicic et al., 2001; Lee, Djousse, Sesso, Wang, & Buring, 2010; NHLBI Obesity Education Initiative Expert Panel, 2000). **Supporting evidence:** Bauman, 2003; Blair, LaMonte, & Nichaman, 2004; Keim et al., 2004; Mille, Koceja, & Hamilton,1997; Mosca et al., 2007; Saris et al., 2003; Wing & Hill, 2001; Wing & Phelan, 2005.
Prevention, delay, and management of T2DM	Prevention, delay, and management of T2DM: same as those recommended for health benefits; Effective management of T2DM: PA should be distributed over at least 3 days/week, and no more than two 2 consecutive days without PA; Resistance exercise (3 times a week, targeting all major muscle groups) is encouraged among people free of	Standards of Medical Care in Diabetes (ADA, 2007b).

	contraindications.	
Psychological benefits	Reducing depression (DS and CD): same as those recommended for health benefits; Psychological benefits can be attained in single PA bouts of 10-20 minutes; PA intensity and type: individual preference is the overriding factor; Berger's (2004) tentative taxonomy of PA components for enhancing the likelihood of psychological benefits: Aerobic conditioning/enhanced abdominal breathing; Rhythmical breathing; An absence of interpersonal competition; A closed or predictable activity	**Supporting evidence:** Bartholomew, Morrison, & Ciccolo, 2005; Berger, 2004; Berger & Owen, 1998; Daley & Welch, 2004; Darby, Berger, Carels, & Owen, 2003; Dunn et al., 2002; Dunn et al., 2005; Dunn et al., 2001; Fox, 1999; Hamer et al., 2009; King et al., 1993; Meyer & Broocks, 2000; Osei-Tutu, 1998; Paluska & Schwenk, 2000; Perna et al., 1999; Roth et al., 1990; Seime & Vickers, 2006.

Note. *Recommendations for moderate-intensity PA may need to consider individual fitness levels instead of globally prescribing activities of ≥ 3 METs (Lee et al., 2003).

Physical activity intensity versus total amount for attaining health benefits. PA intensity and total amount of PA undertaken are both important elements of the PA recommendations for health benefits. Research findings suggest, however, that the overriding factor when considering the physical and psychological health benefits of PA is the total daily amount of PA people engage in, rather than achieving a pre-determined intensity (Bassuk & Manson, 2008; Bauman, 2003; Duncan, Gordon, & Scott, 1991; Jakicic, Marcus, Gallagher, Napolitano, & Lang, 2003). This finding corresponds with evidence showing that physical and psychological health benefits can accrue from participating in PA involving a range of intensity levels, including low-intensity lifestyle PA. An emphasis on total PA amount, rather than a certain intensity, is an important finding, particularly for individuals who do not enjoy or who cannot perform at, certain PA intensities (e.g., vigorous PA), who are new to exercise (Brown et al., 2007), or who want greater flexibility in ways to incorporate PA into their daily life (USDHHS, 1996). This finding also has particular implications for overweight people with T2DM. Specifically, people with T2DM generally have a lower level of fitness than individuals without diabetes (Albright et al., 2000), which suggests the need for PA intensity to be at a comfortable level for the individual, rather than a pre-set level. Furthermore, Berger (2004) suggested that to facilitate PA adherence in obese populations, it is important to change the perception of exercise from “should” to “want”. Therefore, psychological interventions that encourage AL (i.e., participation in PA’s the person enjoys), rather than a pre-determined PA type or intensity, are likely to be more successful in changing people’s perception of exercise to want. Such interventions are more likely to result in PA participation and adherence (Berger, 2004). The problem of PA adherence, and interventions aimed at increasing adherence, is discussed in the following sections of this chapter.

Physical Inactivity

As previously mentioned, despite known physical and psychological health benefits of PA, the majority of people, particularly women, and those with one or more chronic conditions (e.g., T2DM, overweight, and/or depression), are not active enough to gain these health benefits. For example, paralleling trends in other Western Countries, 70% of Australian adults are insufficiently active (ABS, 2006b), with more women than men reporting no or low levels of PA (73% vs. 66%, respectively; ABS, 2006b). Adults with diabetes are more likely to be physically inactive than those without diabetes (74% vs. 69%, respectively; ABS, 2006c), obese people (particularly women) are more likely report physical inactivity than normal weight individuals (34.8% vs. 30.4% for men, and 38.2% vs. 30.2% for women, respectively; AIHW, 2004). Furthermore, adults with high to very high psychological distress (indicative of elevated DS) are more likely to report physical inactivity than those with no or low levels of psychological distress (48% vs. 31%, respectively; ABS, 2006a). See Appendix B (Table B2.5) for world-wide and Appendix C (Table C2.6), for Australian physical inactivity prevalence figures. Therefore, as previously alluded, overweight women with T2DM and depression represents a high risk population for physical inactivity. Thus, it can be surmised that a reciprocal relationship between depression and PA exists in overweight women withT2DM. In an extensive review of the literature, however, I found no studies that examined whether a reciprocal relationship between depression and PA exists among this population. Given the numerous health benefits of regular PA participation, this remains an important question for future research to examine. Information obtained from such research would assist in the development and implementation of appropriate psychological interventions for overweight women with T2DM and depression.

Health Problems and Economic Burden Associated with Physical Inactivity

In Australia, PA is ranked second (behind tobacco smoking) as the most important factor in disease prevention (AIHW, 2004), and physical inactivity is ranked fourth in terms of the leading cause of disease burden (ABS, 2006b). For example, physical inactivity is a significant independent risk factor for osteoporosis, osteoarthritis, hip fracture (AIHW, 2004; Darren, Warburton, Whitney, & Shannon, 2006; Dubbert, 1992), increased blood pressure and blood glucose, abnormal blood lipids, overweight, and major chronic diseases including CVD, cancer (particularly colon and breast cancer), and T2DM (Barr et al., 2007; Eyre et al., 2004; Telford, 2007; Warburton et al., 2006; WHO, 2009b). Findings from one study showed people with T2DM who dropped out from a17.2 month exercise program had a 10-fold greater risk of CVD compared to those who completed the program (18.4% vs. 1.56% risk, respectively; Shinji, Shigeru, Ryusei, Mitsuru & Shigehiro, 2007). Physical inactivity is also associated with depression (ABS, 2006b; Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991; Cassidy et al., 2004; Darren et al., 2006; Lampinen, Heikkinen, & Ruoppila, 2000) and anxiety (ABS, 2006b; Dubbert, 1992). A review of literature examining the reciprocal relationship between PA and depression is warranted, and is the focus of the latter part of this chapter.

People who engage in low levels of PA are also at higher risk of ACM and CVDM (Telford, 2007; Wei, Gibbons, Kampert, Nichaman, & Blair, 2000). For example, each year, physical inactivity is estimated to cause 1.9 million deaths worldwide (WHO 2009e), and contributes to over 13,000 deaths in Australia (NSW PCAL, 2010). Mortality risk may be even greater among sedentary people who have one or more other mortality predictors (e.g., T2DM, overweight; Wei et al., 1999). Not surprisingly, individual and societal economic costs related to inactivity are substantial,

particularly in Western Countries like Australia (Medibank Private, 2007; Stephenson, Bauman, Armostrong, Smith, & Bellew, 2000) and America (Colditz, 1999). For example, each year in Australia, physical inactivity costs the health care system over $1.5 billion (Medibank Private, 2007). Thus, similar to other chronic health problems (T2DM, overweight, and depression), physical inactivity has a significant independent negative impact on people's physical and psychological health.

Detrimental Effects of Sedentary Behaviour on Health

Paralleling research on the negative effects on inactivity are contemporary findings showing the autonomous impact of a sedentary lifestyle on health and disease prevention. This is concerning, especially considering the increasingly modernised lifestyle, in Western countries like Australia, which emphasises convenience and facilitates a sedentary lifestyle (e.g., labour saving devices such as automobiles, escalators, remote controls, and internet). Consequently, people's need for daily obligatory PA has substantially reduced (NSW PCAL, 2010; Sherwood & Jeffery, 2000). Sedentary behaviour (defined as time spent sitting) has been associated with an increased risk of overweight (Healy et al., 2008a; Healy et al., 2008b; Salmon, Bauman, Crawford, Timperio, & Owen, 2000), developing chronic illnesses such as T2DM and CVD (Dunstan et al., 2004; Dunstan et al., 2005; Dunstan et al., 2007; Hu, Li, Colditz, Willett, & Manson, 2003), and total mortality (Patel et al., 2010). Increased risk of sedentary behaviour on morbidity and mortality have also been shown independent of PA level (Dunstan et al., 2004; Patel et al., 2010; Salmon et al., 2000). For example, in a study by Salmon et al. (2000), regularly active Australian adults who reported watching more than four hours of television per day (measure of sedentary behaviour), were twice as likely to be overweight compared to those who watched less than one hour of television per day, regardless of PA participation (Salmon et al., 2000). Outcomes from

a recent Australian prospective study involving women aged between 45 to 50 years showed no consistent association between sitting time and weight gain over successive 3 year periods. Sitting time was, however, associated with weight for overweight and obese women (van Uffelen, Watson, Annette, & Brown, 2010). Furthermore, Dunstan et al. (2004) found that among 8, 299 Australian adults aged 25 years or more, those who watched at least 14 hours of television a week had more than double the risk of T2DM than those who watched less than 14 hours a week, independent of the effects of PA. Therefore, as well as identifying successful interventions to increase PA participation and adherence, particularly among populations at high risk of inactivity, such as overweight women with T2DM and depression, strategies are also needed to focus on reducing sedentary behaviours. This suggests that interventions encouraging the accumulation of lifestyle PA throughout the day may help to simultaneously increase PA and reduce daily sedentary time. This is especially the case considering that overweight people with T2DM have a lower exercise capacity (Ribisl et al., 2007), and that lifestyle PA may be more appealing to people with T2DM (Kirk et al., 2007), overweight and previously sedentary individuals (Andersen et al., 1999), and people with depression (Richardson et al., 2005) than formal exercise programs.

Poor Adherence to Regular Physical Activity

Getting people initially active is challenging. Ensuring people adhere to regular PA is an equally arduous task (Dubbert, 2002; Martinus et al., 2006; Sherwood & Jeffery, 2000). PA adherence is a multifaceted concept (Heesch, Masse, Dunn, Frankowski, & Mullen, 2003; Martinus et al., 2006), and there has not been a consistent definition of the term “adherence” used in PA research (Hearnshaw & Lindenmeyer, 2006; Shay, 2008). Also, in health care literature, adherence is often referred to as compliance and maintenance (Shay, 2008). Therefore, inconsistencies in the definitions

and terms used has made comparing adherence rates between studies difficult (Schneider, Bassett, Thompson, Pronk, & Bielak, 2006; Shay, 2008). It is beyond the scope of this review to construe the variety of definitions of adherence that have been used. The term adherence is generally associated with one's ability to maintain the behaviour in question (Shay, 2008), in this case regular PA, beyond intervention cessation. Despite inconsistency in its definition, the problem of poor adherence, particularly from pre-determined structured exercise interventions, has been noted in almost all populations, including people with chronic illnesses like T2DM (Dunstan et al., 2006; Hanefeld et al., 1991; Kirk et al., 2007; Kirk, Mutrie, McIntyre, & Fisher, 2003; Woodard & Berry, 2001), those who are overweight (Dunstan et al., 2005), and people with depression (Faulkner & Biddle, 2004; Richardson et al., 2005). For example, previous research outcomes suggest that approximately half of people who begin a PA program will not sustain their participation for more than 6 months (Dishman, 1982; Dishman & Sallis, 1994; Kirk, Mutrie, McIntyre, & Fisher, 2004; Marcus et al., 2000, Marcus et al., 2006). Additionally, in a study by Hanefeld et al., only a quarter of adults with T2DM randomised to the structured intervention group (*n* = 761) had maintained their supervised exercise program after 2 years (Hanefeld et al., 1991). Furthermore, in a 12-month RCT, Dunstan et al. (2005) assigned 36 sedentary overweight men and women with T2DM aged 60 to 80 years at random to either the intervention group (high intensity RT plus moderate weight-loss), or control group (moderate weight loss plus a control program of flexibility exercises). In the first 6 months (Phase one), participants in the intervention group attended 3 weekly sessions of supervised gymnasium-based, high-intensity progressive RT. During the 6-month follow-up (Phase two), participants were encouraged to continue their RT (intervention group) or stretching (control group) in an unsupervised setting, either at home or in a gymnasium. In the intervention group, adherence to the supervised gymnasium-based

program was 88% (Phase one), however, during the follow-up period (Phase two); adherence had reduced to 72.6%. Furthermore, of those who reported maintaining their PA behaviour during the follow-up period, their PA frequency and volume had reduced (Dunstan et al., 2005). Poor adherence to PA is problematic, because physical and psychological health benefits from PA are only experienced while PA participation is maintained.

Theoretical Models of Behaviour Change

Theoretical models of behaviour change provide a way of better understanding the reasons for adopting and adhering to behaviour change such as PA. Theoretical models can underscore and highlight the reasons why people initiate PA in the first place, and how they might continue participation (Culous-Reedm Gyurcsik, & Brawley, 2001). Additionally, these models specify variables and factors related to PA initiation and adherence and provide a rationale as to how the PA participation process works. Thus, understanding these theoretical models can assist with understanding how to intervene to get more people active, and staying active. This is particularly important for people at high risk of inactivity, such as overweight women with T2DM and depression. Many models have been developed to predict PA behaviour. In this section, I provide an overview of three main theories that have generated substantial research support and practical applications for enhancing PA behaviour: Self-efficacy theory (SET; Bandura, 1977, 1982, 1986, 1997), transtheoretical model (TTM) of behaviour change (Prochaska & DiClemente, 1982), and self-determination theory (SDT; Deci & Ryan, 1985, 1991).

Self-Efficacy Theory

Before discussing Bandura's (1977, 1986) SET, it is appropriate to first acknowledge the complex social cognitive theory (SCT) within which self-efficacy

originates. In SCT, Bandura (1986, 1997) suggested that individuals' motivational changes for behaviour (in this case PA) are influenced by physiological, behavioural, and environmental factors, which operate as reciprocal interacting determinants (Bandura, 1986). Self-efficacy is a cornerstone of SCT. Specifically, Bandura (1977, 1986) defined self-efficacy as the situation-specific belief people have in their ability to perform a specific behaviour, in this case PA. Bandura (1986) proposed that the level of one's self-efficacy can be an indicator of self-confidence, and influence motivation and actual performance of the specified behaviour (Bandura, 1986). For example, compared to people with a lower self-efficacy, people with higher self-efficacy are likely to have greater confidence in their ability to perform the target behaviour (e.g., PA), expend greater effort on such activities, and are more likely to persist with the activity when faced with obstacles and aversive stimuli (Bandura, 1986). In SET, Bandura (1986, 1997) proposed four main factors that influence the level and strength of self-efficacy: performance accomplishments, vicarious experience, verbal persuasion, and physiological state. With reference to performance accomplishments, Bandura proposed that positive performance outcomes enhance self-efficacy, whereas negative performance outcomes reduce self-efficacy. Vicarious experiences (also referred to as modelling) involve observing someone else engage in the target behaviour. The observer's self-efficacy is more likely to increase if they perceive the individual they are watching to be similar to themself (Bandura, 1997). With reference to the third antecedent of self-efficacy, verbal persuasion, Bandura (1997) proposed that the persuader is more likely to enhance the listener's self-efficacy if the persuader is perceived to be trustworthy, and a credible source of information. Verbal persuasion can also take the form of self-talk (e.g., positive self talk is more likely to increase self-efficacy, and negative self-talk is more likely to lower self-efficacy). Finally, Bandura (1997) theorized that physiological arousal or specific emotions can influence self-

efficacy when people associate unpleasant arousal or emotions with poor performance (thus lowering self-efficacy), or when they experience comfortable physiological sensations or pleasant emotions that increase their self-confidence in their ability in the target behaviour (thus enhancing self-efficacy). The important factor is how the individual perceives and interprets their physiological responses and emotions, rather than the sheer intensity of their reactions (Bandura, 1997). SET has been used extensively to help predict PA behaviours. Moreover, self-efficacy has been investigated within the context of other theoretical models of behaviour, such as the TTM.

Transtheoretical Model (TTM) of Behaviour Change

The TTM was developed by Prochaska and colleagues (Prochaska & DiClemente, 1982; Prochaska & Marcus, 1994; Prochaska & Velicer, 1997). It became influential in the 1990's in the design of PA interventions, particularly one type of intervention labelled exercise/PA consultations (Dubbert, 2002; Kirk et al., 2007) which is discussed in the *PA Intervention* section of this chapter. The TTM assists in understanding when, how, and why people change behaviour. The model has been used to assist with modifying health behaviours, such as smoking, weight control, psychotherapy (Prochaska & DiClemente, 1982), and PA behaviour (Marcus, Rossi, Selby, Niaura, & Abrams, 1992). In the TTM, Prochaska and DiClemente proposed that adopting a physically active lifestyle is an on-going process and can be considered as a continuum of five stages of behaviour change. These five stages are a core construct of the TTM and are labelled precontemplation, contemplation, preparation, action, and maintenance. Prochaska and DiClemente (1982) proposed that different strategies should be used at different stages of behaviour change to facilitate people's progress to a higher stage and to avoid relapse back to sedentary habits (see Table 2.2 for stage

definitions, and stage appropriate strategies). In TTM, Prochaska and DiClemente highlighted that progress through these five stages is not linear. Rather, people can progress forward or relapse one or more stages, on several occasions while trying to change behaviour, and/or maintain behaviour change. A second core construct of TTM is the 10 distinct processes that Prochaska and DiClemente proposed that individuals use to facilitate behaviour change (thus increasing PA participation in this context). Prochaska and DiClemente argued that five are cognitive based (experiential), and are particularly beneficial for people in the earlier stages of behaviour change (e.g., contemplation, preparation), and five are behavioural based, generally being more useful for those who are already active (Prochaska & DiClemente, 1982).

The TTM also includes two previously-developed constructs: decisional balance, and self-efficacy (which, as mentioned, originates from Bandura's [1977] SET). Decisional balance refers to weighing up the advantages and disadvantages of changing one's behaviour, and appears to be particularly relevant for understanding and predicting behaviour change for people in the earlier stages of behaviour change, e.g., pre-contemplation, contemplation, preparation (DiClemente et al., 1991; Prochaska & DiClemente, 1982). With reference to self-efficacy, applying this construct in TTM as a way to maintain behaviour change is a development of the application of self-efficacy as described in Bandura's SET. Generally, in TTM, Prochaska and DiClemente proposed that a person's self-efficacy increases as they progress through the stages of change (Prochaska & Marcus, 1994; Prochaska & Velicer, 1997). A large amount of research support exists for the application of the TTM to understanding and influencing PA behaviour in the general population, and in people with T2DM (Albright et al., 2000; Kirk et al., 2007; Lowther et al., 2007; Marshall & Biddle, 2001; Mau et al., 2001).

Self-Determination Theory

Deci and Ryan's (1985, 1991) SDT is a broad framework for understanding human motivation to perform behaviour across all domains (such as health care, education, work, religion, and PA). In SDT, Deci and Ryan (1985, 1991) proposed that there are three psychological needs that are important in motivating human behaviour: autonomy, competence, and relatedness. The need for autonomy refers to the desire to engage in self-initiated activities. The need for competence implies that individuals want to interact effectively with their environment. Finally, the need for relatedness is the universal need to want to interact, and to feel connected with significant others. Deci and Ryan argued that all three needs are essential for individuals' health and well-being (Deci & Ryan, 1985, 1991).

In addition to the three psychological needs, Deci and Ryan (1985) proposed that motivation can be viewed in terms of varying degrees of self-determination, which lead to different types of motives being viewed on a continuum. Specifically, Deci and Ryan suggested that this continuum runs from high to low levels of self-determination as an individual moves from intrinsic motivation to extrinsic motivation to amotivation (no motivation). In SDT, Deci and Ryan predicted that intrinsic motivation and extrinsic motivation are multi-dimensional in nature. For the purpose of this review, however, I will highlight the main aspects of each type of motivation. Intrinsic motivation involves engaging in a certain PA as an "end in itself", for example, for enjoyment, interest, feelings of satisfaction, competence, and a desire to persist with the activity (Deci & Ryan, 1985; Ryan & Deci, 2000). On the other hand, extrinsic motivation involves engaging in a certain PA as a "means to an end", for example, to satisfy external pressures (e.g., from a coach, doctor), for status or approval (e.g., from family or friends), to achieve some external reward (e.g., money, trophy), or for health, fitness, or

body appearance motives, such as weight loss (Deci & Ryan, 1985; Ryan & Deci, 2000). In the context of PA behaviour, intrinsic motivation is more likely to form the basis of long-lasting PA adherence, whereas extrinsic motivation is more likely to be successful for short term motivation for the given PA, but not for promoting adherence (Berger, Pargman, & Weinberg, 2007; Kimiecik, 2002).

In summary, the application of theoretical models of behaviour change, such as Bandura's (1986) SET, Prochaska and DiClemente's (1982) TTM, and Deci and Ryan's (1985) SDT, has greatly assisted researchers in the field of sport and exercise psychology with understanding ways to successfully increase PA participation and adherence. Contemporary researchers have demonstrated that theoretical based interventions, such as those that are matched according to individuals' stage of change (SOC) and involve strategies to increase self-efficacy and facilitate intrinsic motivation, are more successful in promoting PA participation and adherence than pre-determined exercise interventions that lack theoretical underpinning (Dubbert, 2002). A discussion on PA intervention, with a focus one type of psychological intervention (PA consultation) is provided in a later section of this review.

Factors Inhibiting or Facilitating Physical Activity Participation

In addition to theories that assist with determining and predicting PA behaviour, it is important to consider the many factors that influence people's PA behaviour. Some factors facilitate people's efforts to either begin or maintain regular PA participation, while other factors inhibit PA participation and adherence (labelled "barriers"), Knowledge of these factors among the population (or individual) of interest can assist in the development of effective theory-based interventions tailored to enhance PA participation for that group (or individual). It should be noted that, in PA research to

date, the terms “correlate”; “determinant”; “facilitator”; and “motivator”, have been used interchangeably both within and between studies. Examples of term combinations used in one study alone include: determinant and correlate (Bauman, Sallis, Dzewaltowksi, & Owne, 2002), determinant and motivator (Burton, Sahiro, & German, 1999), determinant and facilitator (Kehn & Kroll, 2009), and facilitator and motivator (Bauman, Yasova, & Giacobbi, 2010; Casey, De Civita, & Dasgupta, 2010; Kehn & Kroll, 2009). Although each of these terms has subtle differences in meaning, in general, they have a common underlying theme of facilitating/enhancing PA behaviour. Therefore, relevant previous research that has examined PA correlates, determinants, facilitators, and/or motivators, has been included in this review. Nevertheless, to avoid confusion, for the purpose of this literature review and thesis, I use the term “facilitator” to refer to factors that have been shown to facilitate or enhance PA behaviour.

Numerous quantitative, and a small number of qualitative, studies have been conducted to investigate the barriers to and facilitators for PA behaviour for adults in the general population (Frederick & Richard, 1993; Rhodes, Martine, Taunton, Rhodes, Donnelly, & Elliot, 1999; Salmon, Owen, Crawford, Bauman, & Sallis, 2003; Sherwood & Jeffery, 2000; Thogersen-Ntoumani, & Ntoumanis, 2006; Trost, Owen, Bauman, Sallis, & Brown, 2002), and particularly among specific populations with a high prevalence of physical inactivity. These specific populations include female adults (Ansari & Lovell, 2009; Errickson & Gillespie, 2000; Masse & Anderson, 2003; Nowak, Radzinska, & Rynkiewicz, 2009), people with T2DM (Casey et al., 2010; Korkiakangas, Alahuhta, & Laitinen, 2009; Lawton, Ahmad, Hanna, Douglas, & Hallowell, 2006; Mier, Medina, & Ory, 2007; Sweet, Fortier, Guerin, Tulloch, Sigal, Kenny, & Reid, 2009), and people who are overweight (Edmunds, Ntoumanis, & Duda, 2007; Jewson, Spittle, & Casey, 2008; Struber, 2004). Researchers have also examined barriers and facilitators for PA among individuals with clinically diagnosed depression

(Faulkner & Biddle, 2004; Ussher, Stanbury, Cheeseman, & Faulkner, 2007) or experiencing symptoms of depression (Craft, Perna, Freund, & Culpepper, 2008; Vickers et al., 2006). My extensive search of the literature, however, did not reveal any research that has specifically examined the barriers and facilitators for PA among overweight women with T2DM and depression. Because this population is at high-risk for inactivity and poor PA adherence, examining the PA barriers and facilitators for overweight women with T2DM and depression remains an important area for future qualitative and quantitative research to explore. Existing research does, however, indicate that researchers have uncovered several PA barriers and facilitators that are typical in most populations, as well as those factors that are particularly prominent in certain populations, including people with T2DM, individuals who are overweight, and people with depression.

Barriers to physical activity. Several PA barriers appear universal to adults in most populations. These barriers include (perceived) lack of time (Ansari & Lovell, 2009; Jewson et al., 2008; Korkiakangas et al., 2009), low exercise self-efficacy (Casey et al., 2010; Craft et al., 2008; Korkiakangas et al., 2009; Struber, 2004), low motivation (Casey et al., 2010; Craft et al., 2008; Jewson et al., 2008), and a lack of energy (Jewson et al., 2008). Tiredness or lethargy is another commonly reported PA barrier, particularly among adults with T2DM (Korkiakangas et al., 2009), and people with depression (Craft et al., 2008; Faulkner & Biddle, 2004). Laziness has also been reported by some to prevent PA participation, especially among people who are overweight (Jewson et al., 2008). Enjoyment of sedentary behaviour (e.g., reading, watching television) has also been found to contribute to the high number of adults engaging in insufficient PA (Dunstan et al., 2007; Salmon et al., 2003). Thus, for some

individuals, their preference for sedentary activities may facilitate the reporting of other PA barriers, such as lack of time, low motivation, tiredness, and laziness.

Other frequently reported barriers include a lack of knowledge about the benefits of PA (Lawton et al., 2006; Schutzer & Graves, 2004; Struber, 2004), initial high expectations of the exercise program (Jones, Harris, Waller, & Coggins, 2005), or a negative attitude toward PA (Di Loreto et al., 2003). Also, commonly reported barriers among people who are overweight include feelings of being too fat (Kirk, Barnett, & Mutrie, 2007; Korkiakangas et al., 2009; Struber, 2004), and poor body image (Struber, 2004). Additionally, perceiving oneself to be too old to engage in PA (Struber, 2004; Trost et al., 2002), fear of injury (Jones et al., 2005; Struber, 2004), and having physical health problems (Booth, Bauman, & Owen, 2002; Casey et al, 2010; Korkiakangas et al., 2009; Struber, 2004) prevent PA participation for some adults. Pain is a particular barrier to PA among people with T2DM (Korkiakangas et al., 2009; Mier et al., 2007), and those who are overweight (Struber, 2004). Furthermore, experiencing depression has consistently been shown to be a barrier to PA behaviour. This is particularly problematic for people with T2DM and depression, because diabetic complications tend to be worse in people with depression, and these diabetic complications can further hinder PA participation (Kyrios, Nankeryis, Reddy, & Sorbello, 2006), and low levels of PA can further facilitate symptoms of depression.

External barriers to PA are also commonly reported among adults. Such barriers include insufficient social support (Schutzer & Graves, 2004; Struber, 2004; Ussher et al, 2007), or having no exercise partner (Trost et al., 2002). For a lot of people, poor weather (Casey et al, 2010; Craft et al., 2008; Jewson et al., 2008; Lawton et al, 2006; Struber, 2004), a lack of access to exercise facilities (Casey et al., 2010; Trost et al., 2002), and an unsafe neighbourhood (Mier et al., 2007; Struber, 2004) prevent PA participation. Also, financial costs related to transportation and/or gymnasium

membership fees also inhibit PA participation, particularly for lower income earning individuals (Chin, White, Harland, Drinkwater, & Raybould, 1999; Korkiakangas et al., 2009). Facility-based exercise programs can also create additional barriers for some people, such as scheduled class times, which clash with other commitments, and transportation difficulties (Marcus et al., 2006). Furthermore, for some, particularly people at high risk of inactivity, such as overweight women with T2DM and depression, the absence of individualised programs may prevent their participation.

Facilitators for physical activity. Certain factors have been shown to facilitate PA behaviour. For example, higher exercise self-efficacy (as described by Bandura's [1986] SET) is consistently reported as being a dominant factor in assisting individuals to begin and maintain regular PA participation (Edmunds, Ntoumanis, & Duda, 2007; Frederick & Richard, 1993; Kirk, Barnett, & Mutrie, 2007; Schutzer & Graves, 2004; Sweet et al., 2009).

Factor's underlying one's motivation also influence PA participation and adherence. For example, enjoyment of engaging in the PA (a type of intrinsic motivation, as defined by Deci and Ryan's [1985] SDT) is a commonly-reported motivating factor among adults (Frederick & Ryan, 1993; Jewson et al., 2008; Rhodes et al., 1999; Salmon et al., 2003; Sweet et al., 2009; Thogersen-Ntoumani & Ntoumanis, 2006; Ussher et al., 2007). Additionally, autonomous motivation (one of the three psychological needs as proposed by Deci & Ryan's SDT) has been shown to influence PA participation and adherence for some adults (Rhodes et al., 1999; Sweet et al., 2009; Thogersen-Ntoumani & Ntoumanis, 2006).

Support and encouragement to begin and maintain PA, from one's family and friends (De Bourdeaudhuij & Sallis, 2002; Jewson & Casey, 2008; Mier et al., 2007),

exercise staff (Casey et al., 2010), and physician (Schutzer & Graves, 2004), is another predominant motivating factor for adults in all populations. Correspondingly, some adults are motivated to exercise for social reasons (Jewson et al., 2008), such as to spend time with existing friends, or to meet new friends. Additionally observing others (e.g., modelling) engaging in PA facilitates PA behaviour for some individuals (Trost et al., 2002).

The resultant psychological health benefits (Casey et al., 2010; Mier et al., 2007) and physical health benefits (Mier et al., 2007, Frederick & Ryan, 1993; Schutzer & Graves, 2004) of PA are commonly reported facilitators. Other frequently reported facilitators of PA include having a positive perception of PA and the associated outcomes (Kirk et al., 2007; Marrero, 2005), and positive past experiences in PA (Sherwood & Jeffery, 2000; Trost et al., 2002). Furthermore, the convenience of home exercise equipment, perceived and actual access to fitness and recreation clubs, and satisfaction with these clubs, facilitate PA participation for some individuals. Environmental influences have also been cited as motivating factors for PA participation. These influences include having a safe neighbourhood, hilly terrain, and enjoyable scenery (Saelens, Sallis, Black, & Chen, 2003; Sherwood & Jeffery, 2000; Trost et al., 2002).

No two people are the same, therefore, one person's PA barriers and facilitators are likely to differ from those of the next person (Lawton et al., 2006; Masse & Anderson, 2003).Thus, to maximise the effectiveness of interventions aimed at increasing PA participation and adherence among a particular group, in addition to factors that are prominent in the population of interest, the specific PA barriers and facilitators that are relevant to each individual should also be considered (King et al., 1997; Sherwood & Jeffery, 2000).

Reciprocal Relationship between Physical Activity and Depression

A large number of studies (qualitative, cross-sectional, prospective, and meta-analysis) have demonstrated an inverse reciprocal relationship between PA and depression. That is, a relationship in which peoples' participation in PA decreases as their depression increases, and depression increases as PA participation decreases. This inverse reciprocal relationship between low levels of PA and high levels of depression has been reported in various populations, including the general population (Morey et al., 2003), and people with chronic illnesses, such as diabetes (Kyrios et al., 2006; Lin et al., 2004; Lysy et al., 2008; Mier, Medina, & Ory, 2007; Morrato, Hell, Wyatt, Ghushchyan, & Sullivan, 2007; Warburton et al., 2006) and CHD (Carney, Freedland, Miller, & Jaffe, 2002). For example, in a recent review (including 12 studies published between 1996 and 2007), Lysy et al. (2008) concluded that adults with T2DM who are inactive (according to self-report measures) are 1.72 to 1.75 times more likely to be depressed (assessed using self-report questionnaires) than those who are more active. In terms to specific research outcomes, Morrato et al. examined the prevalence of PA among adults with and at risk for diabetes. Data was obtained from participants who took part in The Medical Expenditure Panel Survey (a nationally representative survey of the U.S population). Results showed that adults with diabetes and depression (diagnosed according to ICS-9 depressive disorder or episodic mood disorders classifications) were one-third less likely to be physically active than people with diabetes and no depression (Morrato et al., 2007).

Additionally, in a population-based study, Lin et al. examined 4,463 adults with diabetes (95.6% had T2DM, and almost half [48.9%] were obese). Participants' PA was assessed using a revised version of the Summary of Diabetes-Care Activities measure (Toobert, Hampson, & Glasgow, 2000), and depression was assessed using the Patient

Health Questionnaire (Kroenke, Spitzer, & Williams, 2001). Outcomes showed that of the 12% of participants (particularly women), who reported depression, almost two-thirds (62.1%) reported low levels of PA (e.g., participating in one or less exercise session in the prior week). Although causality cannot be concluded from these study outcomes, it is apparent that a reciprocal association exists between low levels of PA and high levels of depression. Evidence of this relationship is not surprising, because findings from one study suggest people with depression are three times more likely to be non-compliant with medical treatment recommendations than those without depression (Di Matteo, Lepper, & Croghan, 2000). Furthermore, in addition to the commonly reported PA barriers, people with depression experience barriers related to their depression, which can further prevent them from beginning or adhering to regular PA participation (Faulkner & Biddle, 2004; Kyrios et al., 2006; Seime & Vickers, 2006; Vickers et al., 2006). For example, depressed individuals typically engage in all-or-nothing thinking, and undervalue their progress toward changing their sedentary lifestyle (Seime & Vickers, 2006). Symptoms of depression, such as low self-esteem, low self-efficacy, poor self-perception, feelings of helplessness and hopelessness, and social withdrawal, can also hinder participation in PA (Craft et al., 2008; Kyrios et al., 2006; Seime & Vickers, 2006). Additionally, compared to people with lower levels of DS, individuals with higher (more severe) levels of DS are likely to acknowledge more PA barriers, and focus on these barriers, which can enhance the risk of inactivity and poor PA adherence (Craft et al., 2008; Kyrios et al., 2006), for example, via feeling overwhelmed and reduced exercise self-efficacy (Seime & Vickers, 2006). Furthermore, in a study by Vickers et al. (2006), involving 207 individuals with T2DM and DS (as determined by the CES-DS; Radloff, 1977), those with higher levels of DS reported less use of behaviours shown to be helpful in initiating and maintaining exercise, e.g., relapse prevention behaviours, avoiding self-blame. Thus, individuals with depression

may be more inclined than those without depression to either not begin a PA regimen, or, if they have started a PA program, to give up and relapse back to their previously sedentary habits when they are faced with a PA barrier. In turn, this response (low/no PA) is likely to facilitate and/or increase the severity of existing depression.

As previously alluded to, there is also research evidence involving various populations suggesting that PA participation can lead to psychological benefits, such as reduced depression, and such benefits (reduced depression) can, in turn, facilitate further PA participation (Kehn & Kroll, 2009; Mier et al., 2007; Piette et al., 2004; Stathi, Fox, & McKenna, 2002). For example, Stathi et al. (2002) conducted one-to-one and group interviews involving 26 regularly active older male and female adults. For these adults, mood benefits, such as reduced depression, motivated them to engage in regular PA, and also assisted with their adherence. Similarly, Mier et al. (2002) found that the well-being benefits obtained from PA was the motivator to regular participation for their sample of 39 Mexican American adults with T2DM. Furthermore, Kehn and Kroll (2009) used a qualitative-exploratory design to examine the self-reported exercise experiences (barriers and facilitators) of 26 individuals with spinal cord injury. Among their sample, some specifically attributed the psychological benefits of exercise (e.g., reduced depression, stress management, enhanced QOL) to their regular exercise participation, indicating a reciprocal relationship between higher levels of PA and reduced depression. The qualitative design of these studies prevents causal conclusions regarding the relationship between increased PA and reduced depression. Research showing that when people increase their PA, their depression level goes down indicates the benefit of promoting PA participation among people who are depressed.

The optimal treatment for depression among people with diabetes is still evolving (Williams et al., 2006). Glasgow, Toobert, and Gillete (2001) suggested that interventions should be tailored on the basis of reported barriers (in this case

depression) to allow for the examination of the extent to which changes in the barrier/s are related to improvements in study outcomes (Glasgow et al., 2001), in this case PA. Lustman and Clouse (2002) argued however, that optimal treatments are those that improve both depression and diabetes, and that only focusing on depression (a barrier) is unlikely to lead to adherence to self-management practices, like regular PA (Lustman & Clouse, 2002). Consistent with Lustman and Clouse (2002), an optimal treatment for reducing depression among overweight women with T2DM would be one that improves all three chronic conditions: overweight, T2DM, and depression. Thus, a psychological intervention aimed at promoting PA participation and adherence could be considered an optimal depression treatment. Specifically, increasing PA is likely to contribute to weight loss, improved glucose control, and psychological benefits, such as reduced depression. Moreover, such psychological benefits may facilitate further PA participation. The proposed components of psychological interventions tailored for increasing PA participation and/or reducing depression among those with depression (Craft et al, 2008; Vickers et al., 2006) are also considered essential components of a psychological intervention, labelled *PA consultation*, which is discussed in the next section.

Physical Activity Interventions

In preceding sections of this review, I have highlighted that only one-third of people with diabetes and depression are treated for their depression. I have discussed research demonstrating regular PA to be equally effective as other widely used treatments for depression, such as pharmacotherapy and psychotherapy. Additionally, I have noted the numerous physical and psychological health benefits of PA. Despite these health benefits, low levels of PA and poor adherence to structured exercise, particularly among women, and those with chronic health problems (e.g., T2DM, overweight, and/or depression) continues to challenge society at large. Thus, it is clear that effective theory-based interventions are needed to enhance PA participation and adherence, particularly among overweight women with T2DM and depression- a population that would benefit immensely from the health benefits that PA has to offer.

There are studies that have shown that PA interventions, particularly those in supervised settings, are more successful in getting people to begin exercise compared to no intervention, at least in the short term (e.g., 6 months; Dishman & Buckworth, 1996; Hillsdon, Foster, & Thorgood, 2005). For example, Dishman and Buckworth conducted a meta-analysis to determine the effectiveness of interventions (conducted between 1965 and1995) on increasing PA. Their findings showed that interventions for increasing PA can improve success from the typical rate of 50% without intervention to between 70 and 88% (Dishman & Buckworth, 1996). Nevertheless, high drop-out rates from, and poor adherence to, PA interventions reinforce the point that getting people to maintain their regular PA participation remains a problematic issue for health professionals, individuals, and society.

As previously mentioned, structured PA interventions have typically involved an exercise program pre-determined on the basis of physiological principles, and lacking theoretical underpinning from psychology. Over the last 20 years, researchers have recognised the importance of theoretical models of behaviour change, such as Bandura's (1986) SET, Prochaska and DiClemente's (1982) TTM, and Deci and Ryan's (1985) SDT, for understanding and promoting PA adherence (Baranowski, Anderson, & Carmack, 1998; Plotnikoff, 2004), and the authors of numerous reviews have concluded that theory-based interventions are more likely to be successful in increasing PA adoption and adherence than structured, prescribed exercise programs, particularly among the adult population (Dishman & Buckworth, 1996; Hillsdon, Foster, & Thorogood, 2005; Marcus et al., 2006), and individuals with diabetes (Plotnikoff, 2004). Consequently, there has been an expansion in the development of theory-based PA interventions. A growing body of literature has demonstrated that psychological interventions advocating AL/lifestyle PA, which are often theory based (Kirk et al., 2007), are an effective, and desired, alternative to traditional structured exercise programs for encouraging people to begin (Anderson et al., 1999; Dallow & Anderson, 2003; Dunn et al., 1999; Marcus et al., 2006; Paluska, & Schwenk, 2000; Richardon et al., 2005) and, importantly, to maintain, regular PA participation (Kirk et al., 2007). Such interventions have been particularly effective among women (Speck & Harrell, 2003), previously sedentary individuals (Dunn et al., 1999), those who are overweight (Andersen et al., 1999), people with T2DM (Krug, Haire-Joshu, & Heady, 1991), people with CHD (Rogerson, 2009), and depressed individuals (Richardson et al., 2005). For the remainder of this section, the focus is on a particular type of psychological intervention, labelled PA consultation (originally labelled, exercise consultation), which aims to increase PA participation and adherence, and has shown promising results among a variety of populations.

Physical Activity Consultation

Physical Activity (PA) consultation is an individualised, semi-structured psychological intervention designed to promote and maintain PA behaviour change (Kirk et al., 2007; Kirk et al., 2001; Loughlan & Mutrie, 1995). PA consultation is based on the Prochaska and DiClemente's (1982) TTM, and is primarily aimed at sedentary adults wanting to become more active (e.g., those in the contemplation or preparation stage of change; Hasler et al., 2000; Loughlan & Mutrie, 1995). Individuals in the later stages of change (e.g., action or maintenance) can also benefit from a PA consultation, because the consultation encompasses preventing relapse from occurring and managing relapse if it does occur (Loughlan & Mutrie, 1995). Specifically, strategies that have been associated with enhancing PA participation and adherence are used in PA consultations (see Table 2.2 for examples of stage appropriate strategies). Typically, cognitive-based strategies are used in PA consultation for people in the earlier stages of change (e.g., helping people to mentally prepare for increasing their PA behaviour). For people in the later stages of change, emphasis is placed on behavioural strategies, such as relapse prevention, and ways to assist with maintaining their PA participation (Kirk et al., 2007).

The core element of PA consultation is that the strategies used and advice given to each person are tailored to suit the individual's needs, PA preferences, and readiness to change their PA behaviour (Loughlan & Mutrie, 1995). Therefore, in PA consultation, a person-centred approach is adopted (Loughlan & Mutrie, 1995; Kirk et al., 2007). Also, because PA consultations are brief (e.g., approximately 30 minutes); cost effective (i.e., they require no expensive resources); flexible in content and delivery; and can be delivered by any health professionals, this type of intervention is well suited for a variety of health promotion settings, such as GP clinics, diabetes

clinics, leisure centres (Kirk et al., 2007; Lowther et al., 2002). Thus, PA consultation strategies are now recommended for use by clinicians to help motivate their inactive clients with T2DM to adopt and maintain regular PA (Marrero, 2005). Furthermore, PA consultation has become a desirable alternative to structured exercise programs, particularly among sedentary people (Hughes, Mutrie, & MacIntyre, 2007; Kirk et al., 2003; Lowther et al., 2002). General guidelines for conducting a PA consultation, including for people with T2DM, have been published (Kirk, Barnett, & Mutrie, 2007; Loughlan & Mutrie, 1995).

Table 2.2

Transtheoretical Model: Stage of Change Definitions and Corresponding Strategies for Increasing Physical Activity (PA) Participation

Stage	Definition	Appropriate strategies (no order of priority)
Pre-contemplation	Inactive and no intention of becoming active in next 6-months	Information on health risks of sedentary lifestyle, and benefits of being regularly active
Contemplation	Inactive, but intend to become active in next 6-months	Decision balance (reviewing advantages and disadvantages of becoming active) Identifying and overcome barriers Education on current PA recommendations Discuss past and current PA participation Identify PA likes and dislikes, and consider potential PAs (preferably PAs the individual enjoys, or might like to try)
Preparation	Have made some attempts to become more active	Discuss past and current PA participation Identify PA likes and dislikes, and consider potential PA's (preferably PA's the individual enjoys, or might like to try) Encourage individual to start planning where and when these new activities can be carried out Develop realistic short and long term PA goals Discuss the individual's support network, and/or options for developing a support network Education on current PA recommendations

		Assess and enhance the individual's exercise self-efficacy
Action	Active, but only within last 6-months	Reinforce successful attempts at behaviour change Re-emphasise experienced benefits of being active Identifying and overcome barriers
Maintenance	Active for at least 6-months	Identifying high-risk situations/triggers that may have a negative impact (e.g., cause relapse) on behaviour change Developing ways/strategies to prevent relapse during these high-risk situations

Source*:* Kirk, Barnett, Mutrie, 2007; Loughlan & Mutrie, 1995; Schomer, & Drake, 2001

Effectiveness of physical activity consultation in promoting physical activity participation and adherence. To date, a number of RCTs and review articles have provided support for the use of PA consultation, and for psychological interventions that use strategies that are typical components of a PA consultation (Di Loreto et al., 2003; Martinus et al., 2006; Wormald, Waters, Sleap, & Ingle, 2006), for successfully increasing the adoption of, and adherence to, PA among various groups, including the general population (Dunn et al., 1999; Lowther et al., 2002; Wormald et al., 2006), people with CHD (Hughes, Gillies, Kirk, Hillis, & MacIntyre, 2002; Rogerson, 2009), people with depression (Seime & Vickers, 2006) and among people with Type 1 (Hasler et al., 2000) and T2DM (Blair & Church, 2003; Clark, Hampson, Avery, & Simpson, 2004; Di Loreto et al., 2003; Jackson, Asimakopoulou, & Scammell, 2007; Kirk et al., 2007; Kirk & De Feo, 2007; Kirk et al., 2001; Kirk et al., 2003). See Table 2.3 for a review of research on exercise/PA consultations in various populations. For the purpose of the present thesis, I only expand on evidence among people with T2DM. Also, the terms exercise consultation and PA consultation are used interchangeably, depending on the terminology used by the researchers of the respective study.

Table 2.3

Review of Research on Exercise/Physical Activity Consultation Intervention for Increasing Self-Reported Physical Activity (PA) Behaviour

Researchers	Design	Intervention	Population	Outcomes	Results
Loughlan & Mutrie (1995)	Guidelines	Guidelines on how to conduct a PA consultation	General population	-	Guidelines for health professionals wanting to conduct a PA consultation with their patients, and for researchers who want to implement a PA consultation as part of their research
Kirk, Barnett, & Mutrie (2007)	Guidelines	Guidelines on how to conduct a PA consultation	People with T2DM	-	Guidelines for health professionals wanting to conduct a PA consultation with their patients with T2DM, and for researchers who want to implement a PA consultation as part of their research
Seime & Vickers (2006)	Review	Recommendations for how to encourage clinically depressed people to engage in PA	People with clinical depression	-	PA consultation (similar to Loughlan & Mutrie's guidelines) is recommended, discussing components like: -benefits of PA to client; -individual's current/past PA level; -individual's barriers to

			PA; - how to incorporate PA into daily life; -encourage wide variety of PA's; -identifying a realistic first step for initiating PA; -realistic and achievable goal setting; -Encourage social support; and Importance of follow-up visits and/or phone calls Brief overview of PA recommendations for people with depression, and benefits of PA for treating depression
Kirk & De Feo, 2007	Review	People with diabetes	Discussion on PA consultation evidence and delivery for people in general population, and those with diabetes
Marrero (2005)	Practical Tips	People with T2DM	Guidelines for practitioners, to assist them in helping their clients' increase their PA behaviour Guidelines are consistent with strategies used in PA

					consultations (according to Loughlan & Mutrie's (1995) guidelines)
Kirk et al. (2001)	RCT (pilot study)	Intervention (plus 5 week follow-up) including random assignment to 1 of 2 groups: 1. A 30 minute PA consultation^ delivered by researcher (intervention group); or 2. Standard diabetes and exercise leaflet (control group)	Male (*n* = 11) and females (*n* = 14) with T2DM (mean age = 48.64 years; mean BMI = 33.77) Participants recruited from a diabetes patient database and from outpatient clinics in the UK	PA (self report via the SPAQ & accelerometer) *5 week follow-up (in-person attendance at clinic. Baseline measures (stage of exercise behaviour, PA level, QOL) re-assessed).*	Intervention group significantly increased on both PA measures. Control group recorded a decrease in PA. ∆ PA consultation successful at increasing short-term (5-week) PA adherence in people with T2DM.
Kirk et al. (2003) Kirk et al. (2004)	RCT	Intervention (plus 6 and 12 month follow-up) including random assignment to 1 of 2 groups: 1. A 30 minute PA consultation^ delivered by researcher at baseline and 6 months with support phone	Males (*n* = 35) and females (*n* = 30) with T2DM (mean age = 57.6 years; mean BMI = 34.6)	PA (self report (7-day PAR) & accelerometer), stage and process of exercise behaviour change, BMI, glycaemic control, lipid profile, blood pressure, fibrinogen, exercise capacity, and QOL	Intervention group recorded significant improvements in PA levels, exercise capacity, stage & processes of exercise behaviour change, glycaemic control, systolic blood pressure, total cholesterol and fibrinogen.

Kirk, Mutrie, et al. (2004b)		calls 1, 3, 7, 9 months after the consultation (intervention group); or 2. Standard diabetes and exercise leaflet (also received phone calls unrelated to PA; control group)	A total of 50 participants were obese (BMI .30), 16 were overweight (BMI 25-30), and 4 were normal weight (BMI <25). Participants recruited from diabetes outpatient clinics in the UK	*1, 3, 7, 9 month follow-up (phone calls)* *Baseline assessments (PA, physiological and biochemical measures) assessed at baseline, 6months & 12 months after PA consultation (required in-person attendance)*	Control group recorded significant decreases in PA levels, and a decline in glycaemic control and BMI ∆ PA consultation successful at increasing short -& long- term PA adherence in people with T2DM.
Chun-Ja, Hwang, & Yoo (2004)	Control group, pre-post design	Intervention (plus 12 week follow-up) including assignment to 1 of 2 groups: 1. A 60 – 90 minute stage-matched intervention (PA consultation) delivered by researcher, and telephone counselling for 10-30 min, twice a week (intervention group); or 2. Usual educational advice (control group) *Note.* Assignment to one of	Males (*n* = 28) and females (*n* = 17) with T2DM (mean age = 53.29 years) Participants recruited from an Outpatient Diabetic Center at a large University	Stage of exercise behaviour change, PA levels, glycaemic control *12 week follow-up (dependant variables measured at baseline. Mode of assessment delivery not stated.*	Intervention group recorded significant improvements in all outcomes; Control group recorded no change ∆ PA consultation successful at increasing short-term PA adherence in people with T2DM.

		the two groups was achieved by group matching based on participants current exercise stage of change.	Hospital in South Korea		
Jackson, Asimakopoulou, & Scammell (2007)	RCT	Intervention (plus 6 week follow-up) including random assignment to one of two groups: 1. exercise consultation interview (ECI; 20-30min one-to-one interview with dietician, stage-tailored strategies and techniques used to encourage PA behaviour); or 2. Control group All participants received a PA leaflet	Males (*n* = 18) and females (*n* = 16) with T2DM (aged 34 to 75 years) attending a diabetes outpatient's clinic in London, UK	PA and stage of change (SOC; assessed using the PA Questionnaire (PAQ), adapted from the SPAQ) *Six week follow-up (dependant variables measured at baseline, and at week 6, either face-to-face or by postal return).*	∆ Stage based PA consultation effective in increasing PA levels and exercise stage of change.
Hasler, Fisher, MacIntyre, & Mutrie (2000)	RCT (pilot study)	Intervention (plus 3 week follow-up) Random assignment to 1 of 2 group: 1. exercise consultation^ (intervention group); or 2. 'exercise and diabetes' information leaflet only	Male and female (*N* = 34, mean age = 33 years) with T1DM outpatients of a hospital in West of Scotland	PA: self-report questionnaire (SPAQ) *Baseline and 3 week follow-up*	At 3 week follow-up: intervention group increased leisure time PA by 64.8%: a significant increase compared to control group; ∆ Exercise consultation significantly more effective than handing out a leaflet

		(control group)			(on 'exercise and diabetes') for increasing short term PA in people with T1DM.
The Writing group for the Activity Counseling Trial Research Group, 2001	RCT	Intervention (plus 12 month follow up) including random assignment to 1 of 3 groups: 1. Advice (physician advice and written educational materials- recommended care) 2. Assistance (included all components of advice group, plus interactive mail and behavioural counselling at physician visits conducted by trained health educator) 3. Counselling (included advice and assistance components plus regular telephone counselling and behavioural classes conducted by trained health educator)	Male (*n* = 479) and female (*n* = 395) volunteer inactive primary care patients, aged 35-75 years) without cardiovascular disease. Participants recruited from 11 primary care facilities America	Cardiorespiratory fitness (VO2max), PA (self-report, measured by 7-day PAR) *Outcome measurements (self-reported PA by the 7-day PAR; and VO2 max by a treadmill exercise test) conducted at baseline, 6, and 24 months post-randomization. Required attendance at clinic.* *12 month follow-up (7-day PAR reassessed via telephone)*	Women: the 2 counselling interventions were equally effective in improving cardiorespiratory fitness over 2 years compared with recommended care; Men: neither of the 2 counseling interventions was more effective than recommended care ∆ There may be a gender difference (women might need more counselling to increase their PA compared to men).
Hughes et al. (2002)	RCT	Intervention (plus 4 week follow-up) including random assignment to 1 of 2 groups: 1. A 30min exercise consultation^ delivered by	Phase IV cardiac rehab patients (*N* =31) Participants	Leisure time PA (Self-report via the SPAQ), and exercise stage of change. Focus was on achieving and adhering to the	Intervention group significantly increased (by 29.5%) leisure time PA from baseline, whereas control group's leisure time PA declined (by 12%)

		researcher (intervention group); or 2. Discussion of topics unrelated to exercise (e.g., general conversation, patients condition; control group) *Note*. Both groups received equal contact time, and standard exercise information leaflet entitled "Hassle Free Exercise"	were recruited following successful completion of a phase III exercise program based at a district general hospital in Scotland	recommended PA levels for health benefits *4 week follow-up (Participants completed a second SPAQ). Mode of follow-up delivery not stated.*	∆ Exercise consultation successful at increasing short-term adherence to exercise during phase IV cardiac rehabilitation.
Hughes, Mutrie, & MacIntyre (2007)	RCT	Intervention (plus 6 and 12month follow-up) including: Random assignment to 1 of 2 groups: 1. 30 min one-to-one PA consultation^ delivered at baseline (just after programme completion) and 6 months, with brief support phone call after each consultation (intervention group); or 2. usual care (control group)	People with cardiac disease (*N* = 70) who had completed an 11 week supervised rehabilitation programme	Regular PA participation: (self-report PA questionnaire, stage of change for exercise behaviour, and acceloremetry) *Baseline, 6 weeks, and 12 months follow-up*	Regular PA participation was maintained in intrevention group over 12 months (self-report and accelerometry), whereas self-report PA significantly decreased in people in usual care group over 12 months, and total acceloremtetry counts decreased by 8% from baseline to 12 months; Stage of change: high proportion of intervention group in action or maintenance at 12 months compared to control group

					∆ Exercise consultation successfully maintained PA for 12 months after completion of phase III exercise program.
Lowther, Mutrie, & Scott (2002)	RCT *Note.* Participants were able to choose intervention	Intervention (plus 4 week, 3-, 6-, and 12-month follow-up) including: Two experimental groups: Either 1. A 30-min exercise consultation^; or 2. Fitness assessment followed by an appropriate PA prescription Two control groups: Either 1. Exercise consultation control; or 2. FA control *Note.* Both control groups received same intervention: BMI measured, participants received a short explanation of the study, and were given information on PA "Hassle Free Exercise Booklet"	Males (*n* = 135; mean age 38.3 years) and females (*n* = 235; mean age 40.9 years) from a socially and economically deprived community in Scotland	PA (self report via the SPAQ); number and PA status of people volunteering for each intervention and adherence in the long-term study group *4 weeks, 3 month, 6 month, and 12 month follow-up (mail questionnaires)*	Only those who received an exercise consultation significantly increased their PA after 1 year, and had significantly better long term study adherence than those who received a fitness assessment; Significantly more non-regularly active participants volunteered for an exercise consultation than fitness assessment ∆ Exercise consultation successful at increasing short-and long-term adherence in individuals from a socially and economically deprived community.

Wormald, Waters, Sleap, & Ingle, (2006)	Qualitative design: 5 focus groups with people who had attended at least one active living consultation	Initial AL Consultation. Discussion on needs, PA options, goal setting, and other lifestyle behaviours. Maximum of 6 visits at 1-month intervals	Male (*n* = 5) and female (*n* = 11) adults, aged 15-73 years from deprived communities in the UK	PA level, lifestyle habits Emphasis on active living	Participants were extremely positive about the active living service. Many reported increased PA levels, modified eating habits, and enhanced awareness of education regarding healthier living; Those who particularly benefited included the most sedentary, older, unfit, and overweight individuals ∆ Traditional exercise referral schemes should be broadened to encompass everyday lifestyle PA, where referral to a gym or exercise facility is just one of a number of PA options.

Note. PA = physical activity; SPAQ = Scottish Physical Activity Questionnaire; QOL = quality of life; 7-day PAR= 7-day physical activity recall; T2DM = Type 2 Diabetes Mellitus; T1DM = Type 1 Diabetes Mellitus; BMI = body mass index; RCT = Randomised controlled trial; = conclusion from study; ^ = exercise/PA consultation delivered using guidelines put forth by Loughlan and Mutrie (1995).

Physical activity consultation research among people with T2DM. Kirk et al. (2001) conducted a pilot study (5-week follow-up) involving 26 sedentary people with T2DM, to evaluate the effectiveness of an exercise consultation for increasing exercise participation (assessed using the 7-day recall questionnaire and an accelerometer), moving people to a more active stage of change, and enhancing QOL (measured by the SF-36 and 22-item Well-being Questionnaire). Participants were randomly assigned to one of two groups: exercise consultation (exercise consultation and standard exercise information) or control (standard exercise information only) group. The results were promising. At follow-up, 82% of participants in the exercise consultation group increased their stage of exercise behaviour compared to 33% of those in the control group. Also, in the exercise consultation group, weekly PA counts increased by 4%, and the number of participants taking part in sport or leisure PA increased by 55%. In contrast, among the control group, weekly PA counts decreased by 9%, and the number of participants taking part in sport or leisure PA decreased by 6%. Furthermore, compared to the information only group, positive changes in both QOL questionnaires were evident in the exercise consultation group. Specifically, mental health was the only SF-36 subscale with significant between group differences for change in score from baseline to follow-up. Given the small sample in this study, caution is needed when drawing conclusions. Nevertheless, the results indicate the potential of a brief PA consultation among people with T2DM in increasing PA and improving psychological well-being, at least in the short term.

Long-term PA adherence (between 6 months to 2 years), and resulting physiological and psychological changes following a PA consultation, or a psychological intervention using strategies typical of a PA consultation, has also been demonstrated. For example, Martinus et al. (2006) conducted a study (6-month follow-

up) to examine the effectiveness of a psychological intervention on exercise adherence, physiological, and psychological (namely anxiety, measured using a visual analogue mood scale, VAMS) factors in 40 males and females with newly diagnosed T2DM, referred from local GPs. Participants were allocated to one of two groups: exercise-only (EO), or exercise counselling intervention (EP). Both groups undertook a 12-week exercise program (one aerobic, and one resistance training session per week). The EP group received additional exercise counselling (approximately 10 minutes) after each exercise session. Attention was not controlled for in this study. Thus, people in the EP group received additional attention from the researchers compared to those in the EO group, which could account for any differences between conditions. These counselling sessions involved strategies used in a PA consultation, including education about the benefits of exercise, identifying and overcoming barriers, and increasing self-efficacy. At follow-up, all participants showed physiological improvements. Only the EP group, however, showed a significant improvement in anxiety. Of note, there was a significant difference in program attendance between the EO and EP groups during the 12-week intervention. Average attendance rate was 65% vs. 83%, respectively (Martinus et al., 2006). The EP was not a PA consultation per se, the strategies that were applied in the counselling sessions were characteristic of a PA consultation. It cannot be concluded that it was specific components of the counselling that led to the differences reported, because it could be the effect of receiving the extra attention that resulted in the increased attendance rate of people in the EP group. Nevertheless, the results from this study are encouraging in terms of the potential for PA consultations to increase PA adherence, and the resultant physiological and psychological benefits.

Kirk, Mutrie, McIntyre, and Fisher (2003) also demonstrated the long-term effectiveness of exercise consultations, using Loughlan and Mutrie's guidelines, among

people with T2DM. Specifically, Kirk et al. conducted an RCT to evaluate the effect of an exercise consultation on PA participation (assessed using an accelerometer, and the 7-day PA recall) and the resultant physiological and biochemical changes at 6 and 12 months. A total of 70 inactive adults (50% female, 94.3% overweight; mean age of 57.6 years) with T2DM were randomised to either an exercise consultation (n = 35) or a control group (n = 35). PA consultations were delivered at baseline and after 6 months, with follow-up phone calls after 1, 3, 6 and 9 months. Results showed that individuals receiving the consultation had increased levels of PA from baseline to 6 months with no decrease from 6 to 12 months. In the control group, weekly accelerometer counts decreased from baseline to 12 months. Furthermore, compared to the control group, participants in the PA consultation group had improved glycaemic control, and reduced CVD risk factors (Kirk et al., 2003; Kirk et al., 2004).

Di Loreto et al. (2003) examined the long-term (2 years) effectiveness of a counselling intervention (consisting of strategies used in a PA consultation) that could be delivered by physicians in their daily practice, in promoting the adoption and maintenance of PA by people with T2DM. To do this, 340 men and women aged 40 years or more who had been referred by an Outpatients Diabetes Centre were randomised to one of two conditions: the behavioural approach (intervention group; n = 182), or usual care treatment (control group; n = 158). Participants in the intervention group attended their usual visit, and also received a 30-minute counselling session aimed at enhancing self-reported PA participation (assessed using the Modifiable Activity Questionnaire; Kirska & Caspersen, 1997). Main strategies applied in this session included education on the benefits of PA, encouraging and/or finding ways for the participants to increase their support network, determining participants' stage of behaviour change, identifying and overcoming their PA barriers, and inviting the

participants to record their PA behaviour in a PA diary. Certain strategies were also used to enhance participants' exercise self-efficacy (e.g., planning a step-by-step PA program). The results were encouraging. After 2 years, 69% of participants in the intervention group, compared to 18% of the control group achieved the target energy expenditure through voluntary PA. Furthermore, only people in the intervention group achieved significant improvement in their BMI and blood glucose level. Although this intervention was administered by physicians, and was not labelled a PA consultation, it does demonstrate the long-term effectiveness of strategies used in a PA consultation intervention in motivating people with T2DM to participate in, and adhere to, regular PA.

Taken together, outcomes from existing research on PA consultation suggest that PA consultation might be an effective intervention for increasing PA (which is anticipated to lead to psychological benefits, such as reduced depression) among overweight women with T2DM and depression. This, however, remains speculative. No research to date has identified, implemented, or examined (using quantitative or qualitative techniques) the effectiveness of psychological interventions for increasing PA, and associated psychological benefits, among this population. Thus, it is proposed that identifying and examining the effectiveness of interventions, such as PA consultation, in overweight women with T2DM and depression is an important area for future research investigation. Moreover, it is anticipated that examining the effectiveness of such interventions using a combination of qualitative (e.g., repeated, semi-structured interviews), and quantitative (e.g., self-report PA and mood) measures, will provide a richer, more in-depth understanding of the population-specific intervention suitability.

Summary of Literature

In summary, it is clear that complex relationships exist between T2DM, overweight, depression, and physical inactivity, and that each of these conditions has a significant adverse impact on health. PA plays a key role in the prevention and management of chronic health conditions. Unfortunately, as in other Western Countries, the majority of Australian adults do not do enough PA for health benefits. Compared to the general population, prevalence and risk of depression (CD and DS) and inactivity is higher in certain populations, including women, and people with chronic health problems, such as T2DM or overweight. Therefore, overweight women with T2DM are a population at particular risk of depression and inactivity. Moreover, for these women, symptoms of depression are likely to contribute to their lack of PA participation. Given the far-reaching, negative impact of depression and inactivity, and the high risk of both of these health problems among overweight women with T2DM, examining the association between depression and PA in this population is an important direction for future research. Barriers and facilitators to PA have been explored in various populations. Shared and population specific factors that influence PA behaviour have been identified. Knowledge of population-specific barriers and facilitators assists with the identification and implementation of PA interventions tailored to enhance PA among that population. No study has examined barriers to and facilitators of PA among overweight women with T2DM and depression. Therefore, this remains an important area for future qualitative research.

In recent years, numerous PA interventions, typically involving structured exercise have been developed to increase PA participation, and curb the rising prevalence of a range of life-altering and life-threatening health conditions, such as obesity, diabetes, and depression. High drop-out rates and poor adherence to these

interventions, coupled with the rising prevalence rates of overweight, depression, T2DM, and inactivity, suggest that such interventions have not been successful. Contemporary research, particularly RCTs, has demonstrated promising results of a psychological intervention, labelled PA consultation, for enhancing PA participation among various populations. Therefore, this type of intervention may also be beneficial for increasing PA participation and adherence among high-risk populations, such as overweight women with T2DM and depression. This proposal remains exploratory, because no research to date has identified the appropriateness, or examined the effectiveness of PA consultation among this population. Additionally, the majority of research assessing the effectiveness of PA consultation in people with T2DM has focused on the associated physiological and biochemical changes relating to the increased PA. Little research has examined the associated psychological benefits. In the two studies that have mentioned associated psychological benefits, these findings were based on results assessed with global self-report measures of well-being. Although the findings in both studies were encouraging, no study has examined, in-depth or using a specific self-report depression measure, the effect of PA participation on mood, particularly depression, among overweight women with T2DM and depression.

Purpose of the Present Thesis

The purpose of the present research was to provide insight into these current gaps in research knowledge. Specifically, in Study 1, I conducted a cross-sectional study to examine the relationship between depression and PA among overweight women with T2DM. The focus of Study 2 was exploring the barriers to and facilitators of PA among overweight women with T2DM and depression. The third study involved combining the knowledge obtained in Studies 1 and 2 with findings from previous research in similar populations to identify and implement a suitable tailored

psychological intervention aimed at promoting PA among overweight women with T2DM and depression. Furthermore, this intervention study involved qualitative (repeated semi-structured interviews) and quantitative (self-report measures) methods to monitor participants' PA and mood (particularly depression) over a 6-month period, and gain in-depth knowledge of their experiences of taking part in the tailored intervention. The high risk and prevalence of depression and physical inactivity among overweight women with T2DM, the substantial negative health and economic impacts of each of these health problems, and the far-reaching physical and psychological health benefits of PA, underscore the importance of this research and associated outcomes.

Chapter 3: Examining Physical Activity Participation and Depression among Overweight Women with Type 2 Diabetes Mellitus

In Western Counties, such as Australia, there is a high and increasing prevalence of three inter-connected chronic conditions: T2DM, overweight, and depression (ABS, 2009), and women are more likely than men to report depression (AIHW, 2010). Additionally, despite the well known physical and psychological health benefits of PA (Pate et al., 1995), the number of individuals who do not do enough PA to gain health benefits remains high (ABS, 2009). People with chronic conditions (such as T2DM, overweight, and depression) who would benefit most from regular PA participation are even less likely than the general population to engage in regular PA. Furthermore, women are more likely than men to report low levels of PA (ABS, 2009). Researchers have identified an inverse reciprocal relationship between PA and depression. That is, PA participation can have psychological benefits (e.g., reduced depression), and such psychological benefits can assist people to sustain their participation in PA (Babyak et al., 2000). Ironically, however, depression has been considered a major risk factor for poor adherence to regular PA participation (Mier, Medina, & Ory, 2007; Morrato et al., 2007). Taken together, it would be expected that overweight women with T2DM are at a much greater risk of depression and inactivity than those with one or no chronic conditions. Thus, it is predicted that there is a negative relationship between depression and PA in women who are overweight and have T2DM. The purpose of this cross-sectional study, therefore, was to examine the relationship between depression and PA among overweight women with T2DM. This study provided valuable preliminary information for the development of an appropriate psychological intervention aimed at increasing regular PA participation among overweight women with T2DM and depression.

Method

Participants

Power analysis indicated that at a significance level of .05, for a medium effect size of 0.5, and a power of .80, I required 68 participants (Cohen, 1988). Of the 981 questionnaire packs that were distributed (see procedure section of this chapter for further details), a total of 77 (7.85%) participants returned their completed pack, however, four were excluded from analysis because they did not meet the Body Mass Index (BMI) inclusion criteria (i.e., their BMI was less 25), and 12 participants were excluded from the analysis due to incomplete data. Therefore, data from a total of 61 participants were included in the analysis.

Participants were 61 women residing in Victoria, who were overweight (BMI ≥ 25; M = 31.50, SD = 9.87), aged between 30 and 70 years (M = 59.44 years, SD = 7.80), and had diagnosed T2DM. Of these participants, 11 (18%) had been diagnosed with T2DM for 4 years or less, 15 (24.6%) had been diagnosed for between 5 and 9 years, 29 (47.5%) had been diagnosed for 10 to 19 years, and 6 (9.8%) had been diagnosed for 20 years or more. A large proportion (41; 67.2%) of participants reported at least one health complication in addition to their T2DM. Nine (15%) participants acknowledged depression as an additional health complication. Other commonly reported health complications included, although were not limited to, high blood pressure (19; 32%) and cholesterol (6; 10%), arthritis (5; 8%) and osteoarthritis (4; 7%), asthma (4; 7%), and heart complications (4; 7%).

Multiculturalism was evident in this sample. A total of 32 participants were from an Australian background (52%). Among the remaining participants, 19 different birth places were recorded, including Sri Lanka (7%), India (5%), England (5%), Philippines (3%), and Vietnam (2%). Regardless of participants' cultural background, an inclusion

criterion was the ability to comprehend English. The majority of participants (82%) stated English as their main language. All participants were able to comprehend English.

Materials

Demographic information form. See Appendix F. Demographic details were obtained through a short form devised for this study. Information collected included age, weight, height, birth country, time since diagnosis of T2DM, and any other (diabetes and non-diabetes related) health complications.

Hospital Anxiety and Depression Scale (HADS; Zigmond, & Snaith, 1983). See Appendix G. The HADS is a self-report measure consisting of 14 items, with two subscales measuring symptoms of depression (HADS-D) and symptoms of anxiety (HADS-A) during the past week. Each subscale consists of seven questions. For every item there are four possible responses, indicating the severity of the symptoms from 0 (*not at all*) to 3 (*most of the time*). Thus, the range is from a minimum of 0 to a maximum score of 21 for each subscale. A typical question on the depression subscale is "I still enjoy the things I used to enjoy". A typical question on the anxiety subscale is "I feel tense or wound up". Scores below 8 on the HADS subscales indicate no depressive or anxiety symptoms, scores between 8 and 10 on either subscale are most commonly used to indicate mild levels of depressive or anxiety symptoms, scores between 11 and 14 on either subscale are most commonly used to indicate moderate symptomatology, and scores of 15 or above reflect a severe level of depressive or anxiety symptoms. The HADS was chosen to measure depression in this study for two main reasons. First, because the HADS does not contain somatic items, symptoms of depression/anxiety are less likely to be confounded with the physical symptoms of diabetes. Thus, it can be used to measure depression and anxiety for both clinical and

general populations, including people with diabetes (Bjelland, Dahl, Haug, & Neckelmann, 2002; McHale, Hendrikz, Dann, & Kenardy, 2008). Second, the HADS has been shown to have good psychometric properties. The factor structure has been confirmed in a number of studies (e.g., Cameron, Crawford, Lawton, & Reid, 2008). Cronbach's alpha coefficients for HADS-A ranging from .68 - .93 (mean .83) and for the HADS-D between .67 - .90 (mean .82) are good (Bjelland et al., 2002). Similarly, in the present study, good internal consistency for sub-scale was demonstrated (Cronbach alpha for HADS-A .87 and HADS- D .77). Furthermore, in their review of 747 papers that used the HADS, Bjelland et al. (2002) reported good validity (sensitivity to change and specificity).

Scottish Physical Activity Questionnaire (SPAQ*;* Lowther, Mutrie, Loughlan, & McFarlane, 1999). See Appendix H. The SPAQ consists of four questions that assess the time participants spent in occupational and leisure PA during the previous week (minutes per week of at least moderate intensity PA). Occupational PA includes walking at work (e.g., walking to and from your desk, walking up or down stairs) and manual labour at work (e.g., lifting, climbing ladders). Leisure PA includes walking outside work (e.g., walking for pleasure, walking to the shops), manual labour outside work (e.g., digging, washing car), active housework (e.g., vacuuming, scrubbing floors), dancing, cycling for pleasure or to work, and participating in a sport, leisure activity or training (e.g., exercise class, swimming).

The SPAQ also measures current PA stage of behaviour change (a core construct of the transtheoretical model; Prochaska & DiClemente, 1982). The first three questions require a tick-the-appropriate-box response. Of these three questions, the first two questions assess whether people consider themselves to be currently regularly physically active, and if not, whether they were regularly active 3 or 6 months ago. The

third question lists five different categories. Each category represents one of the five stages of change: pre-contemplation, contemplation, preparation, action, and maintenance. Respondents tick the box next to the category that best describes their PA level over the last 6 months. The fourth question requests an answer in a diary format. Specifically, the person is asked to record how many minutes they spent engaging in PA, each day, for seven consecutive days. The SPAQ was chosen to measure self-reported physical activity in this study for two main reasons: First, the SPAQ has been shown to be reliable (r = 0.998[32]; critical value 0.436, $p<0.01$) and to hold strong concurrent validity and limited criterion validity (Bauman, Phongsavan, Schoeppe, & Owen, 2006; Lowther et al., 1999). Second, as mentioned, the measure includes questions to assess participants' stage of exercise behaviour change (Lowther et al., 1999), and thus provides another way to examine PA.

Study 1 supporting letter. See Appendix I. To enhance the likelihood that eligible participants would complete and return their questionnaire packs, a consulting endocrinologist wrote a supporting letter to patients of the clinic where participants were recruited. Each letter was identical, but was personally addressed by the endocrinologist's staff, who were not associated with the research.

Procedure

Following ethics approval from Victoria University Human Research Ethics Committee (VUHREC), I contacted managers from several surgeries and hospitals in Melbourne with established diabetes clinics regarding the possibility of recruiting participants from their surgery. All of the contacted managers were interested and agreed to participate in the recruitment process. I then emailed the relevant surgery manager a two-page information sheet (see Appendix J) which he/she distributed to the health professionals who would be giving a questionnaire package to clients who met

the criteria of having T2DM and being overweight. This information sheet provided a brief explanation of the study details, including the study aims, what was required from participants in the study, participant criteria, the health professionals' role in the recruitment process, the contents of the questionnaire packages, and my contact details.

I delivered the questionnaire packs to each of the clinics, and the managers then distributed the packs amongst the health professionals. The response rate of mail response questionnaires is typically low, around 30% (Hansen & Hurwitz, 2004; Kanuk & Berenson, 1975). Therefore, to maximise the chance of obtaining at least 68 participants, I initially intended to send out 350 questionnaire packs, which is five times the number of participants needed. In total, I delivered 384 questionnaire packs over a 5-month period (between April and September 2008). Each questionnaire pack contained an information sheet about the study (see Appendix K), a demographic information form, the HADS and the SPAQ, and an optional contact details sheet. On this sheet, I informed participants that there would be an opportunity to volunteer to participate in subsequent studies and asked those interested in participating in further research to provide their contact details (see Appendix L), so that I could contact them when I was recruiting for the follow on studies. The pack also included a reply-paid envelope addressed to me at the university.

With reference to distribution of packs to potential participants, health professionals were asked to give a pack to their eligible clients (see recruitment criteria) who were interested in voluntarily taking part in the study. At this point, involvement of health professionals in the recruitment process ended, because questionnaires were number coded, and patients were asked to complete the packs in their own time and mailed their completed packs to me in the reply-paid envelope provided. Return of completed questionnaire packs implied consent.

Over a period of approximately 6 months following distribution, despite reassurance from the managers of these organisations that members of staff were handing out the packs to their suitable clients, I did not receive any responses. The notoriously low response rates to mailed surveys usually occur when they are sent by a faceless organisation. Here they were given to potential participants by a trusted health care worker, who was asked not to press people, but that it was acceptable to comment on the value of this kind of research. Because I received a 0% response rate, I thought perhaps something was wrong with the response process. After checking the response process, a zero response rate was still the outcome.

Clearly, other avenues for recruitment were needed. After several deliberations, I decided to try to gain access to eligible participants through the clinical program of a major diabetes organisation, whose staff agreed to hand out the packs, following approval from their own ethics committee. To increase the chance of obtaining the required number of participants, I extended the age range to include women between the ages of 30 and 70 years (rather than capping the age range eligibility at 60 years), and included the supporting letter from the consulting endocrinologist in the packs at his suggestion. The health nurse at the clinic mailed the packs to eligible women with T2DM, who attended that clinic. Over a 2-month period (during May to July 2009) this method of recruitment resulted in a response rate of approximately 11.4% (34 completed questionnaire packs out of 297 mailed out). Clearly, this still was not an ideal response rate to meet the desired power that was determined for this study. Therefore, I sent a further 300 packs to be mailed to eligible women with T2DM, who attended a related clinic. Between September and October 2009, a total of 43 completed packs were returned (a response rate of 14.3%). Therefore, taken together, over approximately

a one year period, a total of 981 packs were delivered and 77 packs were returned (a response rate of 7.85%).

Analysis

I used descriptive statistics (parametric statistics: frequencies, means, and standard deviations) to describe the variables (demographic information, depression, and PA levels) as appropriate. I calculated Pearson product-moment correlation coefficients to explore the relationship between depression and PA for overweight women with T2DM. Additionally, I used the Independent groups t-test to determine if there were any differences in participants' depression level with reference to their PA stage of change (PA SOC; non-active vs. active).

Results

Descriptive Statistics

Depression. In this research, I was interested in the relationship between depression and PA, therefore results based on the HADS-A subscale are not reported or discussed any further. Only results based on the HADS-D subscale are reported. The majority of participants (n = 51; 83.6%) reported at least a mild level of depression (HADS-D score of 8 or more). Of the participants indicating depression, 9 (14.8%) had a mild level of depression, 15 (24.6%) had a moderate level, and 27 (44.3%) had a severe level of depression. Overall, the mean depression level reported was indicative of a moderate level of depression (HADS-D score of 12.34, SD = 5.2).

Physical activity (PA). The mean total amount of weekly PA (occupational- and leisure-based PA) recorded on the SPAQ was 814.43 minutes per week (SD = 808.44). Participants were more likely to record participating in leisure-based PA (M = 605.13, SD = 453.95) than occupational-based PA (M = 209.30, SD = 471.04). Because the majority of participants (n = 39) indicated their occupation as being retired, home

duties, or unemployed, and the specific types of occupation-based PA (walking at work, and manual labour at work) were not common modes of PA for participants, the occupational-based PA subscale of the SPAQ was not examined any further. Thus, I examined only the leisure-based PA subscale of the SPAQ. Active housework was the main type of leisure-based PA for participants (M = 226.31, SD = 259.9), followed by walking (M = 207.69, SD = 270.6). The least utilised forms of PA reported by participants were manual labour outside work (M = 90.25, SD = 195.5), and sport-based PA (M = 80.89, SD = 141.5).

Physical activity stage of change (PA SOC) and depression. Another way to examine PA is to look at participants' PA SOC. Generally, earlier SOC categories (pre-contemplation, contemplation, preparation) suggest the individual is not yet regularly engaging in the activity, whereas later SOC categories (action and maintenance) suggest the individual is regularly engaging in the activity. Similar to previous research examining exercise SOC (Ingledew, Markland, & Medley, 1998; Rogerson, 2009) to further examine the PA behaviour of overweight women with T2DM in this study, I grouped these five SOC categories into two broader types of behaviour: non-active (including pre-contemplation, contemplation, and preparation), and active (including action and maintenance). The type of behaviour labelled "non-active" indicates less PA compared to the behaviour labelled "active".

A total of 33 participants classified themselves as being non-active and 28 claimed they were physically active. Independent-groups t-test results showed participants classified as non-active had a mean depression level of 11.85 (SD = 5.8), which is indicative of a moderate level of depression. Active participants reported a somewhat higher mean depression level of 12.93 (SD = 4.5), although this is still within the moderate level of depression range (as determined by the HADS). Overall, based on

independent group t-test results there was no significant difference in the depression level of non-active and regularly active participants– t (59) = -.801, p = .426.

Relationship between Leisure-based Physical Activity and Depression

Pearson product-moment correlation coefficient was used to describe the relationship between leisure-based PA and depression. As shown in Table 3.1, Person's correlations revealed a small (albeit not significant) negative relationship between depression and the amount of time spent in total leisure-based PA. This suggests that the higher the depression level of participants, the less PA they undertook. There was a significant negative relationship between depression and the leisure based PA sub-type: active housework. This implies that participants with higher levels of depression engaged in a smaller amount of active housework.

Table 3.1

Pearson's Correlations (r) for Depression and Leisure-Based Physical Activity

HADS-D and Leisure-Based PA	Correlation (r)	*p*
HADS-D and leisure-based PA (total)	-0.11	.42
HADS-D and walking	0.02	.90
HADS-D and sport	0.09	.49
HADS-D and manual labour (home)	0.01	.96
HADS-D and active housework	-0.25*	.05

Note. Asterisks (*) denotes significant value

Discussion

In this cross-sectional study, I aimed to examine the relationship between depression and PA among overweight women with T2DM and to determine whether there was a difference in depression levels for people who perceived themselves as being non-active compared to regularly active, as identified by their PA SOC. Analysis of results showed a trend for active housework and walking being the main types of PA done by this group of overweight women with T2DM. This finding is consistent with past research, in which researchers have found lifestyle-based PA (e.g., housework) and walking to be preferred PA modes for women (ABS, 2009; Adams, Der Ananian, DuBose, Kirtland, & Ainsworth, 2003; Ransdell, Vener, & Sell, 2004), people who are overweight (Adams et al., 2003), those who live a sedentary lifestyle (Jakicic & Otto, 2005; Wormald, Waters, Sleap, & Ingle, 2006), and people with depression (Richardson, Avripas, Neal, & Marcus, 2005; Ussher, Stanbury, Cheeseman, & Faulkner, 2007).

Prevalence of Depression among Overweight Women with T2DM

Substantial evidence indicates a high risk of depression for people with one or two depression risk factors: women, people with T2DM, and/or people who are overweight (BMI $\geq$ 25). For example, in a study by Roupa et al. (2009), 41.4% of women with T2DM reported depression (measured using HADS), and Sotiropolous et al. (2008) reported 48.4% of the sample indicated depression (assessed using BDI). Similarly, in a study by Heo et al., (2006), 41.2% of overweight (BMI $\geq$ 25) women indicated that in the past 30 days, they had experienced a depressed mood for at least seven days (Behavioural Risk Factor Surveillance Survey). See Chapter 2, literature review, and Appendices D (Table D2.7) and E (Table E2.8) for table summaries of study outcomes regarding prevalence of depression (CD and DS) in people who are

overweight, and people with diabetes, respectively. Findings from the present study further suggest that people with all three depression risk factors: overweight, female gender, and T2DM, have an even greater risk of depression (83.9%), and at a more severe level (44.3%). There are several possible explanations for the high prevalence of depression in the present study sample. For example, perhaps the combination of these three variables (overweight, T2DM, female gender) has an additive effect on depression risk, resulting in overweight women with T2DM being a high risk population for depression. Considering previous research has found women with T2DM and a higher BMI to have an increased risk of depression (Roupa et al., 2009), this proposition seems likely.

Another possible explanation is participants' depression scores were biased by their diabetes symptoms. This was unlikely to be the case. The HADS is a reliable and valid measure (Bjelland et al., 2002), and excludes somatic items. Therefore, there is less chance that symptoms of depression/anxiety are confounded with physical symptoms of somatic illnesses (Bjelland et al., 2002; Davies, Dempster, & Malone, 2006; Engum et al., 2005; Lloyd, Dyert, & Marnett, 2000; Pouwer, Beeekman, Luback, & Snoek, 2006; Smarr, 2003; Vileikyte et al., 2005). Furthermore, participants' depression scores do not appear to have been inflated by the HADS-D subscale cut-off value of 8 used to indicate at least mild depression. This widely used value is recommended by Zigmond and Snaith (1983), and has been shown to provide an optimal balance between sensitivity and specificity (Bjelland et al., 2002). The optimal HADS-D threshold value for identifying a severe level of depression, however, is not as well established as the mild and moderate cut-off scores. This is likely because few studies have further categorised the HADS-D subscale scores by separating the typically used "moderate to severe" depression category (Hobbs, 2008). Consequently, among

research that has distinguished between a moderate and severe level of depression, there has been inconsistency in the cut-off value used to indicate a severe level of depression. Some studies have used a HADS-D cut off value of 15 (Cameron, Crawford, Lawton, & Reid, 2008), whereas others have used a slightly more stringent cut-off score of 16 (Crawford, Henry, Crombie, & Taylor, 2001; Tuthill, Slawik, O'Rahilly, & Finer, 2006). Psychometric research is needed to determine the optimal HADS-D value for identifying a severe level of depression, particularly in a diabetic population. The cut-off value used has repercussions on the number of people identified as experiencing depression and anxiety, as well as the consistency of (depression/anxiety) prevalence outcomes between studies. In this study, a cut-off value of 15 resulted in 44.3% participants being classified with severe depression. A re-analysis of data using a cut-off value of 16 resulted in 32.8% participants, which remains a concerning proportion. Nevertheless, caution needs to be applied when interpreting any research using the HADS to identify people with a severe level of depression.

The delivery mode of the HADS used in this study (mail response) is also a factor to consider. Outcomes from some studies examining mixed-mode effects have shown that participants' depression score is higher when data is collected by mail than when the same measure is administered in a face-to face (Aquilino, 1998; Geerlings et a., 2004; Torbjorn, 1998) or telephone interview (Lungenhausen et al., 2007). It has been suggested that interviews are superior to posted questionnaires because the context provides participants with the opportunity to clarify questions (De Leeuw, 1992; Geerlings et al., 2004). On the other hand, it has been argued that people may be less inclined to speak about their mental problems (and thus respond in a more socially desirable way) with another person (Auilino, 1998; Lungenhausen et al., 20007; Torbjorn, 1998). Additionally, the anonymous context of self-administered modes of

depression measures may result in fewer barriers in revealing sensitive information than face-to-face interviews (Geerlings, et al., 2004). Currently, there is no external criterion to determine which delivery mode to choose (Geerlings et al., 2004), thus explanations for score inconsistencies between modes remain speculative. Nevertheless, the HADS is a self-report measure, and a mail response delivery mode is widely used in research using the HADS, including among people with diabetes (Davies et al., 2006; Engum et al., 2005; Pouwer et al., 2006). Thus, it appears that participants' depression scores in the present study were not likely to be artificially inflated by the delivery mode. Since no study has examined the mixed-delivery mode effects on HADS, this remains an important area for future research. Consequently, caution is needed when comparing findings from the present study to prevalence rates from other studies using depression measures (particularly the HADS) via different delivery modes (e.g., face-to-face or telephone interviews).

There may have been certain systematic factors specific to people attending the two related clinics that could have biased the sample toward depression. The consulting endocrinologist of the clinics where participants were recruited noted that people attending the clinics tend to be of low socioeconomic status (SES), and at the more complex end of the spectrum in terms of diabetes complications. Previous studies have found depression (CD and DS) to be more prevalent in people with low SES (measured by education and/or income) compared to those with high SES (Everson, Maty, Lynch, & Kaplan, 2002; Johnston et al., 2004; Labad et al., 2010; Miech, Caspi, Moffitt, Wright, & Silva, 1999; Peyrot & Rubin, 1999). Because of the present study design, I did not examine this relationship. Thus, this possibility remains speculative, and is an area for future research to consider.

As previously discussed in the literature review (Chapter 2), the presence of diabetes-related health complications increases a person's risk of depression. Therefore, the high likelihood of diabetes-related complications experienced by women in this study may partly have accounted for the preponderance of mild to severe depression reported. Again, examining the influence of diabetic-related health conditions on depression in the present sample was beyond the limits of this cross-sectional study. Therefore, this remains a tentative, yet likely, explanation for future research to explore.

Having considered the possible explanations, it is concluded that the very large proportion of overweight women with T2DM in this study who reported depression appears to be genuine. This high prevalence has important implications for researchers and health professionals working with overweight women with T2DM. The findings of this study indicate the need for the identification and implementation of effective strategies and interventions aimed at reducing depression in overweight women with T2DM. Considering the numerous psychological, physical, physiological, and social health benefits of PA, interventions aimed at promoting PA among this population seem ideal.

Low Response Rate

A noteworthy issue encountered in this study was the low response rate (7.85%; 77/981 packs), which is well below the average reported in research (Hansen & Hurwitz, 2004). The high prevalence of depression among the population of interest might partly have accounted for this low response rate. Depressive symptoms (e.g., lethargy, decreased amount of pleasurable activities, lack of sleep, diminished ability to concentrate, feelings of worthlessness; American Psychiatric Association, 2000) typically increase disinterest among people who are depressed regarding the completion and return of such questionnaires. If depressed women are less likely than those who are

not depressed to complete anonymous mail-out reply paid questionnaires, then women with no depression would be expected to be over-represented in this study. This suggests that the prevalence of depression in this population could be even higher than the high percentages reported here. It is possible however that the opposite is also true. Specifically, women with depression may be more interested in taking part in a study on mood (and thus more likely to respond to anonymous mail-out questionnaires) than women without mood disturbance. Neverthless, the finding of high prevalence of depressive symptoms in this study is a concern.

Several factors may have accounted for the overall low response rate. For example, the low response rate could have been influenced by the third-person and mail-out delivery modes, which meant that I did not have direct contact with participants. Specifically, in the original recruitment strategy, there was a three-tiered structure (i.e., myself, the diabetes clinic manager, and the health professional administering the packs, respectively) before participants were contacted. Another explanation is the possibility of a sampling glitch. The health professionals at the health organisations who delivered (either in person or via mail) the questionnaires to eligible patients may have only given them to women who they thought were depressed (which would also help to explain the high proportion of depressed participants in this study). I do not think this was the case. I informed all diabetes specialists with whom I collaborated in recruitment for this study (who then asked the relevant health professionals responsible for delivering the packs) that eligible participant criteria for inclusion in the study were: female; between 30-60 years (which was later extended to 70 years), overweight (BMI $\geq$ 25), and diagnosed with T2DM. There was no mention of depression level, and I specifically stated (verbally, and in the information sheet provided to these health professionals; see Appendix J) that I aimed to attract

participants with a range of depression scores to allow for the investigation of the relationship between PA and depression. Another reason why it is unlikely the health professionals selected depressed women is that those health professionals were not trained or directed to identify depressed people. Thus, it is unlikely they would have been skilled to accurately select depressed women from the clients with whom they worked. As noted earlier, all participants in this study attended one of two related clinics. There appears to be a genuinely high prevalence of depression among people with diabetes attending these health centres, which undertake the role of managing people at the more complicated end of the diabetes range. Therefore, in future studies, researchers should recruit participants from a variety of sources.

Relationship between Depression and Physical Activity among Overweight Women with T2DM

Leisure-based physical activity and depression. There was a small (albeit not significant) negative relationship between depression and the amount of time spent in overall leisure-based PA. The cross-sectional nature of this study prevents any causal conclusion. Nevertheless, the negative trend observed corresponds with previous research outcomes which have demonstrated the inverse relationship between depression and PA is complex, and exists in almost all populations, at least among those of interest to this research (i.e., people with T2DM, those who are overweight, people with depression, and women). Overall, substantial existing evidence indicates that participating in low levels of PA is likely to be both a cause and consequence of depression. Perhaps the negative impact of depressive symptoms (e.g., fatigue, lethargy, low self-esteem, feelings of helplessness, difficulty with problem solving, social withdrawal) on PA is partly the result of the diminishing effect these symptoms have on one's exercise self-efficacy (Craft, Perna, Freund, & Culpepper, 2008; Ussher et al.,

2007). Also, people with depression have been shown to be more inclined to give up and relapse back into sedentary habits when faced with barriers (Vickers, Nies, Patten, Dierkhising, & Smith, 2006). Regardless of the underlying cause of this reciprocal relationship, both depression and inactivity independently have an adverse impact on health. Consequently, this relationship has been labelled the "inactivity trap" (Elfrey & Zieglestein, 2009). The potential for PA to reduce depression, and the negative trend between depression and overall leisure-based PA observed in this study, emphasise the need for effective psychological interventions aimed at increasing PA among overweight women with T2DM and depression

Active housework and depression. The need for effective interventions to promote PA among this population is further supported by the finding of a significant negative relationship between depression and active housework, which is a sub-type of leisure-based PA. Again, causal conclusions could not be drawn from this study. This is an important finding nonetheless. Specifically, it suggests overweight women with T2DM who are unable or perhaps unwilling to carry out lifestyle/activities of daily living (ADL), such as housework (e.g., because of perceived and/or actual barriers), report higher levels of depression than those who are able to complete such tasks. Alternatively, elevated depression level may reduce the (perceived and/or actual) capacity or desire to carry out ADL. Both possibilities seem likely. Previous research outcomes have demonstrated an inability to carry out ADL to be a trigger of elevated depression in older adults (Bozo, Toksabay, & Kurum, 2009; Takahashi et al., 2006). Also, there is existing evidence showing that high levels of depression reduce people's capacity and participation in lifestyle activities/ADL (including active housework) in older adults (Iwasa, et al., 2009), people with major depression (Barge-Schaapveld, Nicolson, Berkhof, & De Vries, 1999; Benditt, 2004; Breslin, Gnam, Franche, Mustard,

& Lin, 2006), and overweight adults with osteoarthritis (Possley et al., 2009). For example, Breslin et al. (2006) found the odds of participants with major depression reporting an activity limitation (e.g., difficulty carrying out tasks around the home) were between 3.4 and 5.7 times as high as those for people with no depression (Breslin et al., 2006). Moreover, Possley et al. (2009) examined the relationship between depression (assessed using the CES-D) and functional status in 112 overweight male and female adults (aged 50 years or more) with osteoarthritis. According to their findings, a higher level of depression was associated with reported (perceived) decreased functional ability, more so than (actual) physical performance tasks (e.g., 3-min stair climb, 6-min walk). They surmised that in people with depression, physical function (e.g., shopping, performing domestic duties) may be more influenced by their depression level than actual physical ability (Possley et al., 2009). Therefore, for overweight women with depression, perhaps their perceived ability, rather than actual ability, has a more powerful influence on whether they engage in the activity, in this case, active housework. Further evidence of the negative influence of depression on carrying out daily tasks comes from a qualitative study by Benditt (2004), involving seven women and two men (aged 49 to 71 years) with depression. Participants reported that experiencing pronounced depressive symptoms (e.g., no energy, consumed by negative thoughts) was a key barrier preventing not only participation in PA, but in all aspects of their life. Making comparisons between the present study outcomes and the outcomes from other studies is somewhat difficult for several reasons, including differences in study samples and PA and mood measures used. Despite these differences, the similar negative relationship between depression and active housework found in the present study to most similar research has important practical implications for researchers and health professionals aiming to increase PA among overweight women with T2DM.

Specifically, it underscores the importance of assessing depression level, because despite people's actual ability, experiencing elevated depression may negatively influence their perceived ability, and, thus, affect their participation in lifestyle activities.

Possible explanations for the absence of significant relationship between physical activity and depression. Attention needs to be given to the finding of no significant relationship between overall leisure-based PA and depression in this sample. Several explanations may have accounted for this lack of significance. One explanation relates to the heavily skewed depression scores (to the high end of the HADS-D scale) among this sample. Thus, the imbalance in representation of people with high and low levels of depression on the HADS-D may have partially masked any differences in PA participation. In a sample in which depression scores are distributed more widely across the range, there is greater potential for a substantial correlation to emerge.

Another likely explanation is that participants varied in their understanding of the concept of PA, and the exertion intensity required to achieve health benefits. Lowther, Mutrie, Loughlan, and McFarlane (1999) found that on the SPAQ "occupational walking" PA component, participants included bouts of standing. For example, one shop manager reported seven hours of walking at work, which is unlikely to be a real reflection of this participant's actual time spent engaged in PA (Lowther et al., 1999). Thus, perhaps participants in the present study, particularly those with depression, were more inclined to include all types of PA (e.g., washing dishes, cooking), regardless of intensity or actual time spent moving while performing the activity. This issue is discussed in the methodological issues section of this Chapter.

Social desirability bias might also have played a role in the absence of a significant finding between overall-leisure based PA and depression. Specifically, to be

viewed favourably, participants may have reported more PA than they actually engaged in. Social desirability bias is a risk for all research involving self-reported PA as an outcome measure (Elley, Kerse, Arroll, & Robinson, 2003; Prince et al., 2008). Of course, use of one or more objective PA measure (e.g., accelerometer, heart rate monitoring, doubly-labelled water) would have been ideal, however, in the present study, objective measures were not feasible because of budget restrictions and study design. Nevertheless, the SPAQ is a well-validated and reliable measure of PA (Lowther et al.,1999), and using questionnaires to record information on PA has been shown to be both practical and valid for epidemiological studies (Elley et al., 2003; Valanou, Bamia, & Trichopoulou, 2006), including patients with severe mental illness (Dubbert, White, Grothe, O'Jile, & Kirchner, 2006).

Additionally, consideration needs to be given to the substantial differences between the correlations for the four leisure PA sub-types: walking, active housework, sport, and manual labour outside work (e.g., digging, washing the car). Walking and active housework were the main modes of PA for this sample of overweight women with T2DM, whereas sport and manual labour were the least utilised modes of PA. Perhaps the more "optional" types of leisure PA, such as sport, or manual labour tasks were done very little by most of the women in this sample of overweight women with T2DM, which would made it very difficult to get a meaningful correlation. People must do housework at some level, but they do not have to do sport at all, nor do they have to do manual labour jobs. It is understandable that people who are substantially overweight or who are experiencing some of the physically-limiting complications of diabetes, such as visual impairment, foot and leg problems, or even amputations, would not voluntarily choose to participate in sport or do heavy manual labour around the home and garden. Similar to the argument that it is not possible to get a noteworthy correlation if

everybody scores about the same on a variable, such as almost everybody scoring high on depression, if everybody scoring very low on a PA area like sport, then a very low correlation would be the outcome, regardless of the variation in depression scores.

In light of these possible explanations, the negative trend that was found between depression and leisure-based PA, and the significant relationship between depression and active housework in overweight women with T2DM, has important research and practical implications. Clearly, considering the negative effect of depression on PA, including daily activity tasks, effective psychological interventions aimed at increasing PA participation among this population need to be identified and implemented.

Physical Activity Stage of Change (PA SOC) and Depression

There was no significant difference in the depression level of overweight women with T2DM who reported being "non-active" (i.e., participants who considered themselves to be in the pre-contemplation, contemplation, or preparation SOC) or "active" (i.e., those who indicated they were in the action or maintenance SOC). As discussed in Chapter 2 (literature review) the five SOC are categories derived from the Transtheoretical Model (TTM). These SOC categories are a step removed from a person's actual PA level, because SOC is not about the amount or intensity of PA the person engages in, but whether they are thinking about becoming active (contemplation), about to become more active (preparation), or have been active regularly active for less than six months (action), or more than six months (maintenance). Consequently, some studies have shown that SOC is associated with increasing level of reported or measured PA (Calfras et al., 1996; Jackson et al., 2007; Kirk, Mutrie, McIntyre, & Fisher, 2003; Marcus et al., 2000), while others have not (Naylor, Simmonds, Riddoch, Velleman, & Turon, 1999; Norris, Grothaus, Buchner, &

Pratt, 2000). The absence of a significant difference in depression level between those who reported being non-active and those who indicated that they were active may be because participants were asked to indicate (in the SPAQ) their SOC for "overall PA". It may be that SOC is more useful when applied to a specific activity (e.g., running, or attending an aerobics class). For example, a person can clearly determine how often they attend or think about attending an aerobics class at the gym (thus, track their SOC progression in that specific activity), but walking around supermarkets or household chores like vacuuming or mopping the floor, is harder to integrate into "overall PA" for most people. Thus, perhaps participants differed in what PA they considered contributed to their overall PA level. I previously discussed the potential influence of different definitions of PA on the actual amount of PA participants recorded in the SPAQ. With reference to SOC, different perceptions of what is considered PA may have also influence the SOC category participants perceived themselves to be in. Nevertheless, it is important to acknowledge that having an indication of a person's SOC can be useful. Specifically, such information can assist researchers and health professionals implementing an individualised, stage-matched PA intervention (e.g., exercise/PA consultation; Loughlan & Mutrie, 1995), in choosing appropriate strategies to enhance the likelihood of individuals progressing to the next SOC, thus, increasing their readiness for exercise behaviour.

Reported Physical Activity Participation

Attention should be paid to the finding that nearly half of the participants reported some regular activity. On the one hand, the SPAQ records all types of PA, including active housework, and participants' activity level was analysed on a continuum. Therefore, reporting some PA is likely. Additionally, it may be that participants differed in their interpretation of what types and amounts of PA to report,

which in turn, may have led to an inflation of reported PA on the SPAQ. This potential problem is discussed in the *Methodological Issues* section. On the other hand, this finding could be an indication that the increased public and media attention in recent years concerning the benefits of PA and/or the negative health impact of living a sedentary lifestyle is having a positive influence on people's lifestyle choices (Chau, Bonfiglioli, Chey, & Bauman, 2009; Craig, Russell, & Cameron, 1998; Owen, 2006; Owen, Bauman, Booth, Oldenburg, & Magnus, 1995). It could also be that overweight women with T2DM are putting into action medical advice from their physician to be more active. Research indicates that older adults have regular contact with their physician, and value their advice (Balde, Figueras, Hawking, & Miller, 2003; Burton, Shapiro, German, 1999; Schutzer & Graves, 2004). For example, Burton et al. (1999) examined the determinants of beginning and maintaining an active lifestyle among 2, 507 older adults (aged 65 years or more) who took part in the Johns Hopkins Medicare Preventive Services Demonstration. Results showed that of the 301 participants who initiated PA, 40% indicated they began an exercise program because of their physicians' influence (Burton et al., 1999). In particular, the psychological benefits of PA for people in the general population (Plante & Rodin, 1990; Fox, 1999; Murphy, Nevill, Nevill, Biddle, & Hardman, 2002; Blumenthal, Williams, Needels, & Wallace, 1982), and among those with CD (Blumenthal et al., 1999; Singh, Clements, & Singh, 2001) have been well documented. Because of the specific focus of this quantitative study on the relationship between depression and PA, I did not include a measure of participation motives, so the reasons why participants engaged in PA could not be determined. Accepting that, with some caution, it can be concluded that depression does make overweight women with T2DM more sedentary, and acknowledging that PA can reduce depression (Dunn et al., 2005; Hamer et al., 2009; USDHHS, 1996), an important

direction for future research is to examine what acts as barriers and facilitators for PA among overweight women with T2DM and depression. Such information would be valuable in the construction and implementation of interventions designed to increase participation and adherence to PA, and reduce depression, among this population.

Methodological Issues

Several methodological issues were raised by this study, which should be considered in future research. Because of recruitment issues, the sample size was slightly less than I aimed for. Thus, it would be beneficial to conduct a similar study with a larger sample size. Although the sample size approached the number suggested by power analysis, a substantially larger sample might have clarified the relationship between depression and various types of PA beyond doubt. The planning and logistics for recruitment in studies with populations such as those with chronic illness needs to take into account their understandable reluctance to participate, as well as the likely effect of depression on volunteering.

Another problem I encountered in this study was in relation to the self-report PA measure used. I chose the SPAQ because it is considered to be a reliable and valid measure of PA and is quick and easy to complete (Lowther et al., 1999). Furthermore, it has been widely used in PA research, including among people involved in cardiac rehabilitation (Hughes et al., 2002; Rogerson, 2009), individuals from a socially and economically deprived community (Lowther, Mutrie, & Scott, 2002), and people with Type 1 (Hasler, Fisher, MacIntyre, & Mutrie, 2000) and Type 2 (Kirk et al., 2001) diabetes. In a substantial proportion of cases in the present study, however, very large amounts of PA were reported. There was a lack of consistency among participants regarding their interpretations of what types and amounts of PA to report. This was particularly evident in the occupational PA category, but also applied to types of

leisure-based PA. Other studies, including those by Hughes et al. (2002), and Rogerson (2009), which used the SPAQ to measure PA, also found that very high levels of PA were reported by their participants. Future research using the SPAQ should consider options to minimise the risk of an inflation of reported PA. One option, if possible, would be to administer the SPAQ with the assistance of a researcher, who would give guidance regarding what constitutes PA in each of the categories.

Two factors that may have increased the risk of depression among participants in this study were SES status and experiencing diabetes-related health problems. Because of the research design of this study, these explanations remain tentative. Therefore, quantitative and qualitative research is needed to examine the influence of these, and other variables that have the potential to increase the risk of depression among overweight women with T2DM. Ethnicity is an example of another variable with this potential. A person's experience and expression of depression is influenced by local socio-cultural norms (Griffith, Nakane, Christensen, Yoshioka, Jorm, & Nakane, 2006; Kirmayer, 2001; Kleinman, 2004; Lee, Kleinman, & Kleinman, 2007; Weismann et al., 1996). For example, people from Chinese societies appear to experience depression in a physical, rather than psychological, manner (Kleinman, 2004). Consequently, cultural differences in the reporting of depression have been noted frequently (Bromberger, Harlow, Avis, Kravitz, & Cordal, 2004; Dragomirecka et al., 2008; Myers et al., 2002; Weissman et al., 1996; Pouwer et al., 2010).

Research and practice that involves the self-reported, paper-and-pencil measurement of depression would benefit from further investigation of the optimal HADS-D cut-off score for identifying possible cases of severe depression, and the consistency of HADS scores obtained from different delivery modes (e.g., mail vs. face-to-face interview). The HADS is a sound instrument that is readily administered and

completed. It is short enough not to represent a major imposition on participants anticipated to be experiencing some level of depression. Further, it has been very widely used in published research, so there is likely to be suitable comparison research available. Nonetheless, information obtained from research that clarified the cut off between moderate and severe levels of depression on the HADS would enhance the accurate use of the HADS for identifying people with different depression severity levels in both research and practice settings.

Future Research

The results of this study raised a number of questions that researchers should examine. At the outset, acknowledgement again needs to be given to the smaller than desired sample size in the present study, and it should be noted that the sample was also distributed in some atypical ways, because of the recruitment process. In particular, there was a skew towards severe depression, and there was a small number of women in occupations, both of which might not be typical of women with less complex diabetes, especially combined with overweight. In light of these issues, some questions for future research are raised.

With a larger sample, or a representative sample of overweight women with T2DM, it would be interesting to see whether the relationship between depression and PA is different for women with different levels of depression. No other research has been conducted to date on this important topic. To thoroughly explore this relationship, researchers should consider using a more objective measure of PA, such as an accelerometer or pedometer, in addition to a self-report or interview-administered PA questionnaire. Accelerometers have been found to be a useful device for measuring PA in older adults (Grant, Dall, Mitchell, & Granat, 2008), and inclusion of an objective measure may help to overcome the possible inflation effects in self-reported PA.

Moreover, for application with the broader diabetes and overweight community perhaps it would be particularly interesting to examine the whether the impact of depression on PA differs in notable ways for those who report low and moderate depression levels.

In the present study, active housework was the main PA mode recorded by participants, and the only leisure PA sub-type that produced a significant correlation with depression. In contrast, low levels of PA were recorded for the leisure PA sub-types, namely sports and manual labour outside work. Similarly, in Australia among adults (aged 15 years or more), there is low (26%) and also declining participation in organised sport, with participation rates declining with increasing age (ABS, 2007). National statistics on PA participation includes 'manual labour' as an activity option; however, prevalence rate in this particular activity is not specified. Considering 'manual labour' was not one of the top 10 most popular activities that accounted for 76% of participation in the general population (ABS, 2007), it is likely that there is also a low participation rate in' manual labour', particularly among middle and older aged women. Thus, the low levels of sport and manual labour found in this study may not be unique to women with diabetes. Two questions for future research to consider arise from this finding. First, it is important to know whether this is typical of overweight women with T2DM (or all overweight people with T2DM). For example, women with less complex diabetes might participate in more sport than women with more complex diabetes. Or, low levels of sport and manual labour might be typical for this population. Second, it might be interesting to examine whether the same relationship between PA and depression arises for those who do higher levels of sports or manual labour outside work. Outcomes from such research will have implications for ways to increase lifestyle PA, thus, these remain important areas for future research enquiry.

Measuring occupational PA is problematic by self-report questionnaire. As previously mentioned, this issue was highlighted in the outcomes of the study by Lowther et al. (1999), which showed at least one of their participants included large amounts of time for bouts of standing as “occupational walking” on that SPAQ PA component. Given the use of alternative ways to measure occupational PA among the large number of people with T2DM who do have full-time jobs (e.g., using objective PA measures, or individual interviews to carefully tease out the amount of PA at work), it would be interesting to see how occupational PA does relate to depression among overweight people/women with T2DM. In conducting such research, researchers could investigate whether people with depression do a lot less occupational-based PA (e.g., walking at work, manual labour at work) compared to individuals without depression. They could also examine whether overweight people/women with T2DM and depression move to less active jobs. It might be that overweight women with T2DM somehow force themselves to be active at work, but this kind of activity does not reduce depression (e.g., because it is not intense enough or because forcing themselves to do it makes them more depressed). Insight into such questions would assist in the development of effective psychological interventions aimed at increasing PA and reducing depression among overweight women with T2DM. For example, it may be that increasing occupational-based PA is not an effective means of reducing depression in this population. Recently, researchers have found leisure-based PA, but not occupation-based PA, to reduce depression, among adults from the general population (Harvey, Overland, & Mykletun, 2010; Lin, Halgin, Well, & Ockene, 2008). Harvey et al. (2010) concluded that perhaps the context and social benefits of PA (obtained from leisure-based PA, as opposed to workplace PA) are important in explaining the psychological benefits of leisure-based PA (Harvey et al., 2010). Alternatively, Lin et

al. (2008) suggested that unlike occupation-based PA, leisure-based PA is typically associated with enjoyment (a source of intrinsic motivation), and greater internal locus of control, that is, people perceiving that they control their physical and psychological health, rather than it controlling them. Therefore, these factors may contribute to the antidepressant effects of leisure-based PA. Whether or not these likely explanations also apply to overweight women with T2DM and depression is unknown. Clearly, future investigation exploring occupation-based PA and depression among this population would assist health professionals and researchers in identifying effective ways of increasing PA and reducing depression in overweight women with T2DM.

Further research on the relationship between PA SOC and depression in overweight women with T2DM is also warranted. Similar to previous research (e.g., Ingledew et al., 1998; Rogerson, 2009), in the present study, SOC was measured in terms of the five stages of change (derived from the TTM), which were then grouped into two categories: non-active (precontemplation, contemplation, and preparation) and active (action and maintenance). It is not clear whether this grouping has been done in other research because of sample size not being large enough to examine each stage separately, or whether it is because researchers have considered that differences between adjacent stages are not large enough to warrant looking at precontemplation, contemplation, and preparation or action and maintenance separately. Thus, an interesting topic for future research is to examine the relationships of each SOC to depression separately. It is possible, for example, that overweight women with T2DM in pre-contemplation are less depressed than individuals in contemplation because those who are not contemplating doing PA for its health benefits are unaware that doing PA could really help manage their weight and diabetes. Additionally, individuals in the action stage may be more likely to be depressed than those in the maintenance stage

because they are still struggling to keep up their PA. On the other hand, individuals in the maintenance stage may have an increased likelihood of depression than those in the action stage, because these individuals have passed the exciting stage of increasing PA, so they are no longer deriving any associated psychological benefits from their PA participation. Consequently, PA might be just another habitual part of their life. Of course, these are tentative statements, and knowledge gained from research examining these questions would assist in the development of effective stage-matched PA interventions for increasing PA and reducing depression in this population. Moreover, such research would aid health professionals and researchers in choosing appropriate strategies to enhance the likelihood of overweight women with T2DM and depression progressing to the next SOC, thus, increasing their readiness for PA or the stability of their PA participation.

Additionally, an interesting area for quantitative research using a large sample size, or qualitative research using smaller samples, is to examine whether SOC is related differently to different types of PA. For example, it may be that occupational PA is not really relevant to SOC for PA, because many people would have very limited opportunities to substantially increase their occupational PA. This may also be the case for manual labour around the home (e.g., digging, washing the car). On the other hand, as previously mentioned, it may be that SOC is more useful when applied to a specific leisure-based activity that allows for progression in PA behaviour (e.g., running or attending an aerobic class). This is because the person can determine how often they engage in, or think about engaging in, the specific activity, so they can more readily track their SOC progression in that specific activity. With information of this type, researchers and health professionals could more adequately assist overweight women with T2DM and depression in increasing their level of PA. Furthermore, this

information would help researchers to develop suitable stage-matched interventions for increasing PA behaviour among this population

Taken together, insight into the aforementioned questions will increase health professionals' and researchers' understanding of the relationship between depression and PA/SOC among overweight women with T2DM. Such knowledge could illuminate decisions about how to assist these women in increasing their PA behaviour and reducing their depression.

Summary

In summary, findings from this study provide a valuable contribution to knowledge concerning the relationship between PA and depression in overweight women with T2DM. The findings of this study show that overweight women with T2DM and elevated depression are at much higher risk of inactivity, particularly in carrying out lifestyle activities/ADL, such as active housework. The results have implications for researchers and health-care professionals working with overweight women with T2DM, and have stimulated several questions for researchers to explore in future. Considering the risk depression poses to the development and prognosis of T2DM, and adherence to treatment regimens, including PA, it is imperative that more is understood about the relationship between depression and PA

Chapter 4: The Barriers to and Facilitators for Physical Activity among Overweight Women with Type 2 Diabetes Mellitus and Depression

The findings from Study 1 (Chapter 3) provided an insight into the relationship between depression and physical activity (PA). Further investigation of the relationship between these variables, particularly depression and experiences with PA, is important and warranted. To date, most of the research examining PA barriers and facilitators among people with T2DM has involved quantitative methods, similar to those used in Study 1 (Korkiakangas, Alahuhta, & Latinen, 2009). Information obtained from quantitative research is objective, and can be useful in understanding general trends in a population. Qualitative data on the other hand is subjective, and provides a richer, more in-depth understanding of individuals' specific experiences (Patton, 2002). Existing evidence indicates that overweight women with T2DM and depression have a high risk of physical inactivity. It is possible that the experiences of PA for overweight women with T2DM and depression may be different to the experiences of women with T2DM, but without depression. An extensive literature review revealed no qualitative research exploring the PA barriers and facilitators among overweight women with T2DM and depression. Clearly, there is a gap in current research knowledge which is critical to the development of effective interventions. Therefore, in depth qualitative research is important on this issue. It is for this reason that I conducted this second study. The purpose of Study 2 was to explore the barriers to and facilitators for PA among overweight women with T2DM and depression. It should be pointed out that initially, the target population for this study was going to be women with at least a moderate level of depression (HADS-D score of 11 or more, prior to the interview). The following factors however led me to extend the inclusion criteria to include women with a mild depression level (HADS –D score of 8 or more): There was a limited number (*n*

= 21) of participants from Study 1 who expressed interest in volunteering for this study, and analysis of these participants' HADS-D score (provided at time of interview) revealed only 6 participants had a moderate depression level. Further, in Rogerson's (2009) examination of the relationship between depression and PA in CHD patients, participants were split into two groups (with depression at all levels or without depression). In Rogerson's study, there were notable differences in participants' PA. This indicates that people with depression did behave differently in this important aspect compared to those without depression. Because people with CHD are similar to those with diabetes in that depression is highly prevalent, and low levels of PA are problematic, the same findings could be expected in the present study. Therefore, I extended the inclusion criteria to include participants with at least a mild level of depression (at the time of the interview). Specifically, the present qualitative research was the second of three linked studies. The aim was to explore in-depth the experiences of overweight and depressed women with T2DM, in relation to the influence of their depression on their motivations for, barriers, and adherence to, participation in PA.

Method

Participants

Participants were 11 women with a mean age of 57.7 years (*SD* = 7.7 years). All participants had T2DM, and were overweight or obese (mean BMI = 39.15, *SD* = 11.08). According to World Health Organisation BMI criterion, three of these pariticpants were considered to be overweight, and eight participants were considered to be obese (WHO, 2009c). All participants had taken part in Study 1, at which time they had indicated their willingness to be contacted about further research by providing me with their contact details. An additional inclusion criterion for the current study was participants had scored at least 8 on the HADS-D (at the time of the interview), which is

considered indicative of having a mild level of depression (Zigmond & Snaith, 1983). At the time of the interview, as displayed in Table 4.1, five participants reported a mild level of depression (HADS-D score between 8-10), two participants indicated a moderate level of depression (HADS-D score between 11-14), and a severe level of depression (HADS-D score ≥ 15) was identified in four participants.

Just over half (*n* = 6; 54.5%) of the participants were born in Australia. The remaining five participants were born in India, England, Turkey, Poland, or the Philippines. The majority (*n* = 9; 81.8%) of participants spoke English as their first language. Two participants indicated their native language (Turkish and Filipino). All participants were able to comprehend English. With reference to the duration of T2DM diagnosis (note, duration categories reflect the options provided in the demographic form), two participants reported having T2DM for 4 years or less, three participants specified a diagnosis between 5 and 9 years (inclusive), four participants reported having diagnosed T2DM for between 10 and 19 years (inclusive), and two participants specified a diagnosis of 20 years or more. Most participants (81.8%) had at least one other chronic illness in addition to their T2DM (and overweight). Of these participants, two women indicated one other chronic illness, four women indicated they had two other chronic illnesses, and three women specified at least three additional chronic illnesses. Specifically, nearly half (45.4%) of the participants reported high blood pressure, three participants specified depression as a co-morbidity, and two participants suffered angina. Other illnesses reported included cancer (ovarian, breast), high cholesterol, rapid heartbeat, epilepsy, eye problems, and Hepatitis C.

Information about participants' PA participation and stage of change (SOC) was obtained in Study 1 via the SPAQ. According to their SOC, eight participants indicated being in a non-active SOC (pre-contemplation, contemplation, or preparation) and two

participants reported being in an active SOC, namely maintenance. The SOC of one participant could not be ascertained due to incomplete information she provided on the SPAQ.

Table 4.1

Study 2 Participants Self-reported Demographic Information, BMI, T2DM Diagnosis Duration, Depression Score and Category, Stage of Change, Mean Weekly Physical Activity Amount, Co-Morbid Illness, and Occupation

Born	Language	Age	BMI	T2DM diagnosis (yr)	Dep score	Dep category	Stage of change	*M* min weekly PA	Co-morbid illness	Occupation
Australia	English	56	46	5-9	9	mild	Preparation	1011	hypertension	Professional (director)
Australia	English	55	57	10-19	9	mild	Contemplation	670	Depression, obesity, High blood pressure, cholesterol, arthritis	Home Duties
Australia	English	62	54	20+	8	mild	Precontemplation	0	Depression, High blood pressure	Retired
Australia	English	45	45	0-4	8	mild	Preparation	930	Depression, Hepatitis C	Community Development Worker
Phillipines	Filipino	68	31	10-19	8	mild	Maintenance	NA	NA	Retired
Australia	English	57	38	0-4	11	mod	Contemplation	220	Angina, ovarian cancer	Home Duties
Turkey	Turkish	43	24	10-19	12	mod	Preparation	1980	NA	Own Business
Poland	English	61	30	5-9	15	severe	NA	NA	Epilepsy, Crohns, Eyes, Gastri	Home Duties
Australia	English	62	28	10-19	19	severe	Action	1160	High blood pressure	unemployed
England	English	63	NA	5-9	17	severe	Preparation	810	Angina, Breast Cancer	Home Duties
India	English	63	40	20+ yrs	16	severe	Precontemplation	0	High blood pressure, iron in blood, rapid heart beat	House Wife

Note. NA = Not Available.

Information provided by participants in their interview regarding their barriers and facilitators to PA were analysed at a group level. Thus, for the remainder of this chapter and thesis, participants' in Study 2 will not be discussed individually.

Materials

Because all participants in this study took part in Study 1, which involved participants completing a demographic information form (see Appendix F), obtaining this information again was not required for the present study.

Hospital Anxiety and Depression Scale (HADS*;* Zigmond & Snaith, 1983*).* See Study 1 *Measures* section for details of the HADS. See Appendix G for the scale.

Study 2 interview guide. I developed an interview guide to give a general structure to the interviews (see Appendix M). Specifically, the interviews began with some broad 'ice-breaker' questions (such as the participant's day so far) designed to build rapport with participants and help them relax. When I felt the participant appeared and sounded relaxed, and initial administrative aspects of the study were completed (see Procedure section below), I then asked participants open-ended questions about their present and past PA behaviour, barriers to and facilitators for PA, particularly in relation to their experience of depression (Bogdan & Biklen, 1992). If the participants did not clearly mention the influence of their depression (or mood) on their PA participation by the end of this phase, I then asked follow-up questions specifically regarding whether and in what way depression may have affected their PA behaviour. Clarification and elaboration probes were used to explore issues raised throughout the interview (Patton, 2002).

Procedure

Following ethics approval from VUHREC, I contacted (either by telephone or email) all 24 interested participants from Study 1, inviting them to participate in a one-

off, tape-recorded interview to be held at Victoria University, at a convenient time for them. Almost all participants contacted were still willing to participate. Three declined for personal reasons. For each woman who was still willing (N = 21), I confirmed an interview time and answered any of their queries or concerns. Four participants wanted to take part in the interview, however for various reasons, were unable to make it to the interview venue. Therefore, for these participants, I conducted a phone interview. The procedures for conducting the telephone interview were the same as they were for those who attended the face-to-face interview. The only difference was that I sent these participants the information sheet about the study (see Appendix N), consent form (see Appendix O), and the HADS, and requested they send me their signed consent form and completed HADS prior to the phone interview. Once I received their signed consent form and completed HADS, I arranged a phone interview with them. All participants were asked to complete the HADS because it was more than two weeks since they had completed the HADS in Study 1, so their depression score might have changed. Thus, I interviewed 21 participants.

As previously indicated, interviews began with broad 'ice-breaker' questions. Once I felt that the participant appeared and sounded relaxed, I went through the initial administrative phase: informing the participant about the general process of the interview, and reminding her of confidentiality, and anonymity (i.e., that pseudonyms would be used). Also, for participants attending the face-to-face interview, I asked them to read the information statement, read the consent form, ask any questions about the process, and once they were answered to the participant's satisfaction, sign the consent form, if she was willing to participate, and complete the HADS. I did not categorise their HADS-D score until after the interview. Following the initial administration phase, each interview covered the same topics, as indicated by the interview guide, although

the presentation order of topics varied with the flow of the discussion. All participants were provided with a verbal description of the recommended level of PA for health benefits, and examples of different PA types and intensities. Sometimes, I skipped particular questions that had already been answered by the participant, or if the question was not applicable. For example, if the participant indicated at the beginning of the interview the types of PA she preferred, then, while I was finding out her facilitators for PA, I did not ask what types of PA she enjoyed. At the conclusion of the interview, I thanked each participant for her involvement, and gauged her interest in participating in future research. Interviews ranged in time from 45 to 60 minutes. To avoid excluding any women interested in taking part in the study, I interviewed all women who were willing to voluntarily participate, regardless of their HADS-D score (at the time of the interview). Of the 21 participants interviewed, only data from participants with mild depression (based on HADS-D score of 8 or more, obtained at the time of the interview) were analysed.

Analysis

Participants' (N = 11) audio-taped interviews were transcribed verbatim. I listened to the tapes numerous times and diligently read transcripts repeatedly to ensure accuracy and inclusion of all relevant information (e.g., pauses, laughter). Confidentiality was maintained at all times when dealing with the transcripts to ensure that participants could not be identified through quotations and descriptions.

After transcription, I conducted two inductive content analyses (ICA), following procedures recommended by Patton (2002), Gould, Jackson, and Finch (2003), and Cote, Salmela, Baria, and Russell (1993). In one inductive content analysis, I was interested in identifying the barriers to participants' PA, and in the other, I examined factors facilitating their PA behaviour. Specifically, I took raw data statements directly

from participants' quotations. Depending on the focus of the ICA (barriers or facilitators), I then grouped together similar raw data statements to form raw data themes. According to Cote et al. (1993), ICA allows the elements, categories, patterns, and relationships to emerge from the data, so the themes and dimensions are not predetermined. This type of analysis is based on Glaser and Strauss' (1967) grounded theory approach to qualitative research. Grounded theory does not test or try to prove existing theories. Instead, the focus is on developing concepts and theories (through a continuous interplay between data collection and data analysis) that account for the behaviour of the individuals under study (Glaser & Strauss, 1967). Therefore, the use of ICA in this study allowed common themes, patterns, and categories to emerge from the data that were associated with the experiences of participating in PA for overweight women with T2DM and depression. To ensure minimal overlap between categories, where appropriate, I merged the raw data themes that overlapped or shared commonalities to form higher-level themes. As recommended by Cote et al. (1993), to enhance the validity of the terms, I assigned tag labels, and to ensure that the themes were not biased by my own perceptions, the final labels for the raw data themes were not established until consensus was achieved between my supervisor and I on all stages of this process. The same peer review process was used to validate the first- and second-order themes, and general dimension (GD) category labels.

Results

In this section, I present the two ICA outcomes. First, I report the ICA outcomes for participants' PA barriers, and then, the ICA outcomes for participants' facilitators to their PA behaviour. For each ICA, I present a table illustrating the first-and second-order themes, and general dimensions. I then elaborate on each GD and associated second- and first-order themes. Pseudonyms have been used to ensure participants' anonymity.

Barriers to Physical Activity

Barriers to PA refers to factors that participants claimed hindered their PA participation. In reviewing participants' PA barriers, I identified 26 raw data themes, 12 first-order themes, eight second-order themes, and four general dimensions. These general dimensions were labelled health limitations, lack of motivation, effects of past sedentary behaviour, and environment. Table 4.1 illustrates the raw themes, first- and second-order themes, and general dimensions of participants' barriers to PA.

Table 4.2

First- and Second-Order Themes and General Dimensions of Physical Activity Barriers for Overweight Women with T2DM and Depression

1st order Themes	2nd Order Themes	General Dimensions
Physical health (inc. weight)/associated pain (*n* = 10)	Functional limitations for activity of daily living (ADL)	Health limitations
Physiological limitations (low fitness, low energy, tiredness, or age) (*n* = 6)		
Depression/low mood (*n* = 10)	Psychological health limitations	
Adverse reaction to substances (medication; chlorine) (*n* = 2)	Adverse reaction to substances	
Other commitments/disinterest (*n* = 9)	Low exercise priority	Lack of motivation
Low motivation/laziness (*n* = 8)		
Low exercise self-efficacy (*n* = 4)	Low exercise self-efficacy	Effect of past sedentary behaviour
Limited PA opportunity during childhood (*n* = 2)	Effect of past sedentary behaviour	
Limited PA opportunity in Culture (*n* = 1)		
External /Environmental obstacles (*n* = 4)	Lack of exercise opportunity	Environment
Reduced lifestyle opportunities to exercise (*n* = 4)		
Lack of social support (spouse/other) (*n* = 3)	Lack of social support	

Note. (Numeral) next to each raw data theme refers to the number of participants (total *N* = 11) who made this response.

Health limitations. The GD health limitations refers to PA barriers stemming from ones' physical, physiological, and/or psychological health status. The health limitations GD contains three second-order themes. These include functional limitations for activities of daily living (ADL), psychological health limitations, and adverse reactions to substances. For most participants, this GD was the main barrier to PA, and was expressed with the most frustration.

Functional limitations for activities of daily living. The second-order theme functional limitations for ADL was a major barrier for most participants. This theme refers to restrictions in carrying out fundamental PA's in daily life. It consists of two first-order themes: physical health (including weight) and associated pain, and physiological limitations.

Physical health (including weight) and associated pain. Nearly all participants talked about their physical health problems associated with their T2DM, other chronic illness (e.g., heart, cancer, arthritis), excess body weight, and/or ailments (e.g., back, leg, knee, and foot problems) as being the main causes of their inactivity. One participant said "I think the diabetes was starting to take a little toll on me I wasn't as fit as I use to be" (Amy). Another participant commented "Walking I do, but it would be very slow. You know I have a slipped disc and the pain goes further… it's the pain. The pain is terrible... I just take two steps and I have to sit down" (Kim). This participant also talked about her other health issues, including "high blood pressure, diabetes, and excess iron in [her] blood" that hindered her exercise participation. Comments made by two other participants that highlight these significant barriers include:

> Maybe the last 2 or 3 maybe 4 years but it's got really bad. I was walking a certain amount but I've hurt my knee. I've had a couple of arthroscopies on it and I'm finding it harder and harder to move around. I know that both knees

> have got arthritis in them and they must be playing up as well…I find it hard to bend down and pick things up and very unbalanced to go to the loo and things like that (Jen);
>
> I've had a lot of illness since 2000. 2003 I had ovarian cancer…the diabetes was diagnosed in January 2006, but I have a feeling I had it long before that…and my heart. Having heart problems was a bit of a wakeup call and a bit frightening I suppose at 50 having three stents put in…I have had times when I have started up the walking regime either with my husband or on my own. This usually results with something going wrong with my knee. So I give up. But I was hoping after this knee replacement that it would be alright but my foot started to get sore and I am back to square one (Betty).

It was evident through the tone of their speech, facial expression, and choice of words that functional limitations (FL) also impinged on psychological health. The inability to be physically active for one participant appeared to lead to feelings of failure- letting other people and herself down. She described being inactive "for at least 2 years because of the injuries", and said that "it's annoying. Physically I feel restricted, but emotionally I feel that I am letting the team down because we are trying at the moment to keep all of us fit and exercise is the one way I think of doing it, but it's just a bit hard. It's a depressive state of affairs because you know how important it is" (Erin). Another participant mentioned that she "was enjoying it [the gym], but I just can't run up and down on the spot anymore. It just kills me" (Belinda).

Nearly all participants acknowledged their weight as being an obstacle to their exercise participation. For example, one participant said "we play cricket, [during] which I didn't exercise very much and I found it very difficult to exercise with my

weight. I had no motivation...it just seems like a hopeless situation" (Sue). The hindrance of body weight was further demonstrated by the following comments:

> I use to do it all in one day and go shopping and everything. I use to do it all in one day when the kids were younger. But now I have slowed down and I would say my weight has got a lot to do with that (Betty);
>
> When I get on the bike I find that as my legs come up I have a very large overhanging stomach. As my legs come up they hit my stomach and it makes it quite sickening I have to say. The jostling makes you feel quite nauseous (Jane).

Physiological limitations. Six participants referred to one or more physiological limitations, such as low fitness, low energy, tiredness, or age. For example, one participant said "the feeling of actually how unfit I am" (Jen) was a barrier for her. Some participants acknowledged tiredness as the problem. For example, one participant commented "I feel tired and when I feel tired I don't feel like getting up and doing something" (Kate). Another participant referred to her age as preventing her from exercising:

> I enjoyed it [exercising at the gym, but] sometimes I feel that I am too old to join with them. Because I believe old people cannot manage the time. All the ones doing the work with me were all young ones. And I said no I am too old to be in this age group (Kate).

***Psychological health limitations*.** All participants in this study were identified as having at least a mild level of depression, and nearly all women acknowledged that depression/low mood, which was the only associated first-order theme in this second-order theme, was a major barrier to their PA. Some spoke about the causes of depression, including their (or other family members) health problems, numerous life stressors (e.g., the stress of going through a divorce, and family court), problems

stemming from their childhood, and loneliness. One participant described a number of these issues:

> It [exercise participation] has dropped down because I've had various other things going on in life...stress and sorts of things like that. I had a divorce, and I had family court, and I had to sell the house, and buy a house, and umm, keeping the family together and finding work, and all of this going on in the lifestyle, so it became very stressful. And umm, I had to deal with those things. Other than thinking about exercise (Amy).

Another participant (from Pakistan) expressed the negative effect being away from her family (who were living in Pakistan) had on her well-being. In particular, she described the feeling of loneliness:

> And when I go back [to Pakistan] I am happy…if I had my way and if I had enough money and I won the lotto I would say bye bye Australia and I would go home… For me it is loneliness because over here the people don't mix… when I was in Perth I stayed for 15 years in one house I tried my utmost I cooked and gave food to my next door neighbour and she would say thank you and that's all. I had a culture shock there. I had to see a psychologist for 3 years. I was very bad. I got to that state that I didn't know who I was. I use to go and phone someone and say who am I? And then they use to tell me. So mostly for me it is loneliness (Kim).

Experiencing depression resulted in a permanent or temporary decrease in participation in all aspects of daily life, and an increase in more sedentary behaviour. One participant said during periods when her depression level was high, she was "sort of not wanting to talk to the neighbours, not wanting to go out, I had to sort of drag myself out to do the shopping" (Amy). Another participant mentioned "every single day

I struggle to get out of bed. To start off with, my mood is low when I get up...I'd say 4 out of 7 days my mood is pretty low [and] if I am feeling down all I do is doona therapy" (Sue).

A few participants also claimed that depression or low mood is what stopped them from being active, reflected in the following statement:

> I think I have a little bit of a problem because I know and I understand every part of me is telling me that I need to be doing the exercise. I need to lose weight. I know all the processes. I know all the foods to do and not to do. I know the whole thing. And yet I still cannot bring myself to do the exercise. I guess this is very psychological. I don't understand if I know I need to do it to stay healthy and to keep looking after her, what is there in my head that is preventing that from occurring. That's been a really big issue for me for a few years now. I've never really probably spoken to anybody about it. But I can also at the same time understand how important the psychologist's role is to manage your weight loss stuff (Jen).

Although psychological health limitations was a second-order theme, it was also connected to most of the other second-order themes, such as physical/physiological health limitation (e.g., body weight, low energy, and tiredness), low exercise priority, low self-efficacy, and lack of social support. For example, with reference to body weight, one participant talked about the reciprocal relationship between her mood, exercise, and weight:

> I can definitely see that there is a connection between my mood, and the amount of exercise that I do and the weight that I have put on so it's a real cycle. Like I go and see my doctor and I put on 5 kilos and I get depressed even more, less exercise more to eat but I feel like I've deserved less to eat (Sue).

It was evident that during periods when depression level was high, participants were unable to overcome this psychological barrier preventing them from being physically active.

Adverse reaction to substances. The second-order theme adverse reaction to substances contains two first-order themes: adverse medication side-effects, and allergic reactions to chemicals preventing exercise participation. These barriers were each noted by one participant. For example, one participant was simultaneously taking anti-depressant, relaxation, and sleeping tablets. She said "I felt like a zombie sometimes...because you are in a relaxed- not really relaxed- zombie sort of. Some days you feel like why bother with anything" (Betty). Another participant commented "my daughter said why don't you go and do aqua aerobics? But I have an allergy and my face will get very red. I tried it, but I said no because the chlorine is maybe too much for me" (Donna).

Lack of motivation. The GD lack of motivation is about barriers to exercise reflecting a lack of interest or desire to engage in exercise, or negative perceptions about one's ability to engage in exercise. Low motivation can also arise from having multiple health conditions. This category encompasses one second-order theme, namely low exercise priority.

Low exercise priority. The second-order theme low exercise priority was a commonly reported barrier, and contains two first-order themes: other commitments/disinterest in PA, and low motivation/laziness.

Other commitments/disinterest. Two participants were simply not interested in exercise, despite knowledge of its health benefits. Most (nine) women expressed the main reason for their inactivity was other commitments and priorities. In particular, family commitments, and attending doctor's appointments were noted by several

participants. One participant discussed her daughter's recent illness, and noted that "when she [daughter] went home out of rehab, and even after that my thoughts were with my daughter all the time" (Amy). For this participant, taking care of her daughter was her main priority, which she reported resulted in her inactivity. Similarly, another participant commented "I have a lot of issues around caring for my daughter, and I am gradually finding that her stuff is just creeping in more and more" (Jen). Another participant highlighted the guilt feelings she had about exercising because it would require more time spent away from her children: "I've worked full-time, not being home for the kids, you know my daughter. I've got two children. Always that guilt about going out again [to exercise]" (Sue).

A further remark highlighted the inhibiting influence of family and other commitments on participants' PA participation:

> Well sometimes I'm busy going to the doctors for myself or for my husband, and sometimes my daughter needs me...ah unless I get sick or as I said before I have a doctor's appointment, but I usually try and [go for a walk] ahh, if you know, I go if I can (Vicki).

Low motivation/laziness. The majority (eight) of participants reported that although they were aware of the benefits of exercise, their lack of motivation and laziness prevented them from engaging in exercise. For example, one participant said "sometimes I feel lazy. I will say I will walk later on, later on, later on. Very lazy. Because if you are walking alone its different" (Donna). The following account also demonstrates this common barrier:

> The motivation has been a problem...I've lacked motivation for everything...I think about [exercise] everyday , that I should be doing more exercise, and I'm pushing myself to go to the community centre, and I push myself to do other

> things. Umm, so its an everyday thinking, so I'm still sort of in the early stages I think up, umm perhaps getting into a better routine of doing something with my life (Amy).

For one participant, her lack of motivation stemmed from having an unclear purpose for exercise:

> I have a problem with exercise. I just can't see the point of walking around the block. Someone would say let's go for a walk and look at the nice houses and I would say what nice houses. I have this great big shop there and factories and schools. I really do struggle with that and yet as I said every part of me knows I should be...there's just something somewhere stopping me (Jen).

Similarly, having no exercise goal was a barrier for one participant, and might have inhibited her motivation. This participant acknowledged "I know it's an excuse, but I've got nothing to look forward to. I don't have a goal in front of me" (Hayley).

Also, two participants' low motivation was reflected in their boredom. One woman said "I did general gym work for a long time, but I got a bit bored with all of that" (Monica).

Effect of past sedentary behaviour. The GD effect of past sedentary behaviour refers to low exercise self-efficacy, limited PA opportunities during childhood or cultural influences, which have affected PA behaviour during adulthood. It contains two second- order themes labelled low exercise self-efficacy and effects of past sedentary behaviour.

***Low exercise self-efficacy*.** The second-order theme low exercise self-efficacy (also the label for the associated first-order theme) was expressed by four participants. Self-efficacy refers to the belief that one has about their ability to successfully engage in the behaviour in question, in this case, exercise. For example, one participant said "I'm

not a very good exerciser, I put myself off" (Monica). Similarly, another participant commented "Yeah I probably think it's hopeless. Because I have trouble maintaining a diet, like I think why bother exercising,...I think I am too frightened to start" (Sue).

One participant's low exercise self-efficacy was reflected in her negative perception of exercise, which prevented her PA participation. For this participant, managing T2DM, her weight, and new behaviours (e.g., PA) seemed too overwhelming. For example, she referred to exercise as being "too hard", and "just another difficult thing to do", acknowledging "if anything, it's probably a chore that I have to do to lose weight" (Jen).

Effect of past sedentary behaviour. This second-order theme contains two first-order themes, labelled limited PA opportunity during childhood, and cultural influence effects of past sedentary behaviour.

Limited PA opportunity during childhood. Two participants noted that their negative childhood experiences limited their opportunities to engage in exercise and this played an influential role in their current inactivity. One participant commented:

> I've led a very stupid life as a child and young adult. Very sheltered I guess...I wasn't allowed to have friends. Basically my school years were get up go to school come home do my homework have tea and go back to. Get up again and that was my life. I've been very ignorant for years (Jen).

Cultural influence. One participant referred to her cultural background as a barrier to her PA participation. This participant said that her inactivity is "because of the background. I have a Turkish background...there's not many Muslim women who chuck on the leotards and go out for a run" (Kate).

Environment. This GD refers to external reasons preventing PA participation, and contains two second-order themes, labelled lack of exercise opportunity and lack of social support.

***Lack of exercise opportunity*.** This theme refers to external obstacles or factors perceived to be outside one's control as being barriers to PA. It contains two first-order themes: external/environmental obstacles and reduced lifestyle opportunities to exercise.

External/Environmental obstacles. Four women reported external or environmental factors (e.g., poor weather, unsafe neighbourhood, or lack of transport) as being PA obstacles. For example, weather conditions were a PA deterrent for a few women. For some of these women, the hot weather was perceived as being too unpleasant to exercise. This is reflected in the following comment:

> I don't like the heat...the heat sort of makes me tired and more, and I 'spose not really lazy but I can't do so much in the heat, I can do more when it's cold than when it's hot. Makes me slow down (Vicki).

For others, the cold and wet weather were perceived as barriers to their exercise. One participant said "now its winter I cannot [walk] because it's too cold. Two times a week only maybe this winter time...I never walk if it's too cold" (Donna).

Living in an unsafe neighbourhood was a barrier that prevented one participant from doing PA. She commented "all night I am, you know, scanning through noise. And all of this...two-three houses away, one husband killed his wife. And in the back, they got raped" (Kim). Furthermore, a lack of transport was consistently talked about as being a main barrier preventing one participant from engaging in PA, particularly fitness-centre based exercises. This participant frequently commented with frustration "I

can't get to places". She was aware that "there's lots of classes out there but you've got to get to them" (Monica).

Reduced lifestyle opportunities to exercise. A concern for four participants was the reduced opportunity to engage in exercise as a result of lifestyle circumstances. One commented "we don't have two young kids to look after any more. [I don't] have to do as much running around" (Jane). Another participant referred to her sedentary office job as being a barrier to her being more active. This participant said "I was sitting in an office and all I would do would be develop manuals and training programs on the computer" (Kate). Also, a concern for one participant was that the exercise she enjoyed [group exercise class] was too expensive. This participant said she "would join the class, but it's the money thing that stops me" (Kim).

Lack of social support. The second-order theme social support contains one first- order theme, also labelled lack of social support. Specifically, a few women referred to the lack of support from their spouse or others as being barriers to PA participation. For example, one participant commented "your partner has to encourage you...I didn't get none of that...yeah, so, I had to leave [Weight Watchers]. I just left, you know. Just drifted out" (Kim).

A lack of support from exercise professionals and fellow exercise patrons in a gym setting was also a barrier for one participant:

> You were going there [to gym] and you were isolated anyway and they are all fit as a fiddle and you are not fit, overweight, and it's really hard not to feel out of place. You don't feel encouraged. You're sort of left there on your own and I'm really a people person sort of thing (Sue).

Facilitators for Physical Activity

The second ICA focused on facilitators for PA, which refers to factors that encouraged participants to engage in PA. In examining participants' facilitators for PA, I identified 20 raw data themes, nine first-order themes, six second-order themes, and three general dimensions. These general dimensions were labelled to improve health, lifestyle, and the positive role of others. Table 4.2 illustrates the raw themes, first- and second-order themes, and general dimensions of participants' PA facilitators

Table 4.3

First- and Second-Order Themes and General Dimensions of Physical Activity Facilitators for Overweight Women with T2DM and Depression

1st order Themes	2nd Order Themes	General Dimensions
Improve physical health (incl. weight loss) (*n* = 7)	To improve physical/physiological health	To improve health
Improve physiological health (fitness) (*n* = 3)		
Enhanced wellbeing (*n* = 11)	To improve psychological health and well-being	
Break from daily routine (*n* = 5)		
Instrumental facilitator's to PA (e.g., transport walking, taking grandkids to park) (*n* = 5)	Instrumental facilitator's to PA	Instrumental PA
Group exercise/socialising (*n* = 9)	Company/Socialising	The positive role of others
Support (spouse/others, incl. doctor) (*n* = 6)	Social support/encouragement	
Positive role model (self and others) (*n* =1)		
Comparativeness (*n* = 3)	Comparativeness	

Note. (Numeral) next to each raw data theme refers to the number of participants (total *N* = 11) who made this response.

To improve health. The GD to improve health reflects participating in PA to improve physical and/or psychological aspects of one's health. It contains two second-order themes, labelled to improve physical/physiological health, and to improve psychological health and well-being. Overall, this GD was expressed by the majority of participants, and with the most emotion.

To improve physical/physiological health. This second-order theme contains two first-order themes: improve physical health (including weight loss), and improve physiological health (fitness).

Improve physical health (including weight loss). In addition to T2DM, most women reported one or more other chronic conditions, and six indicated PA was a necessary part of their management regimen for these conditions. For example, one participant said she "knew that [she] had to exercise because of the diabetes" (Amy). Another participant highlighted she walked "for all of my illnesses. I mean I've got the heart, the diabetes…they're all good for walking" (Monica). As well as exercising to manage existing health conditions, a small number of participants indicated they exercised to prevent future health problems. For example, one participant commented "well health again. I've got to say that this osteoporosis is a frightening thing. We've learnt that if you don't exercise your calcium depletes. So again it's being able to stand up tall" (Jane).

Weight loss was also a factor motivating four participants to engage in PA. For example, one said "I walk because I want to make sure that my sugar will go down and my weight will go down also. That's why I started walking. And it has helped me" (Donna). Another participant commented "[her] weight goes up or down…and once the weight goes on I have to get it off" (Betty).

Improve physiological health (fitness). Wanting to improve one's fitness level in order to carry out daily tasks provided motivation to exercise for three participants. For example, one participant mentioned:

> I try and walk sometimes, and sometimes I have a rest I get a bit tired too, the muscles get a bit stiff. But now muscles are getting a bit better, they, in the beginning they were very stiff but now it's a bit better since I've been on the move (Vicki).

With reference to her walking, the same participant indicated "it did make my body not so tight; all the muscles were a bit looser and it makes it a bit easier to walk" (Vicki). Other participants referred to their noticeable fitness improvement as a motivating factor for further participation. For example, one participant said "in the last couple of weeks I have started to do the exercises [prescribed] for me and I am a bit better than what I was" (Jen). Another participant commented "When I first started, I couldn't even get off the floor! And after about three or four months I was getting up by myself and I was really working, you know" (Belinda).

To improve psychological health and well-being. This second-order theme encompasses two first-order themes, labelled enhanced well-being, and break from daily routine.

Enhance well-being. All participants indicated that enhanced well-being benefits, such as feeling good and feeling better following PA participation, was a facilitating factor. Participants' accounts demonstrated that these feel-good benefits were derived from various factors, including increased PA self-efficacy, improved fitness, and the satisfaction of engaging in healthful behaviours. For example, one participant commented "I think that there has to be an underlying feeling that you are

doing good and you're looking after yourself and that's got to be good" (Jane). Another participant said:

> If I can do it a couple of times and feel good and remember that that feels good I can do it again. Like I know I can do that. As I said a couple of years ago I was walking, and because I need to be near a phone I was just walking around the block. I was doing it about 20 times and it made me feel great. I was energetic and I wasn't sleeping in the car (Sue).

Additionally, one participant said after exercise "I feel like my whole body is full of energy. I'm happy and I say ahh I'm so happy I feel like that" (Donna). One participant simply stated that exercising makes her "feel good within [her] self" (Kate).

Feeling better from exercising was a commonly reported motivator for participants. One participant mentioned "If I sort of a bit active I feel better in myself, I can move around, walk around, I feel better in myself. And if I lose a bit of weight, it's even better, I don't feel so heavy" (Vicki). This participant also spoke about feeling better, regardless of weight loss: "Yes I did [exercise] because I felt a bit, maybe I didn't lost weight, but I felt better" (Vicki). Another participant said "I suppose it would sort of be an uplifting affect because you know you've done it and you feel better after you've done it…and you probably have a bit of spring in your step" (Betty). Similarly, one participant stated "…by the time I've gone up the street and walked around, I feel better" (Monica). Furthermore, for one participant, the increased energy she derived from walking made her feel better: "Oh it's a big difference because you feel that you are stronger and you have more energy….you have your energy and you are happy…we have a big supermarket. I go around 2 times and…I feel better" (Donna).

Additional factors that provided enhanced well-being benefits for some women included a sense of achievement, enjoyment, and exercising to de-stress. For example, four participants talked about the sense of achievement they felt engaging in exercise, which enhanced their psychological well-being, and encouraged them to maintain PA participation. One of these participants indicated, after exercising "I felt satisfied even though I felt exhausted" (Amy). Two participants said that their enjoyment of the exercise facilitated their participation. For example, one of these participants (who at the time of the interview was unable to participate in PA due to a physical injury) said she "[exercised] for the enjoyment…I used to like the exercise, I used to get a buzz out of that, what you'd call, you get a high out of that" (Amy). Additionally, the other participant who regularly attended hydrotherapy classes said "I enjoy going to hydro…it makes my body not so stiff, I enjoy it, and, I get pleasure out of it" (Vicki). Finally, one participant consistently reported with strong emotion that for her, walking was a means of stress management, and thus, enhanced her psychological well-being. For this participant, exercising allowed her the opportunity to be in the environment, which distracted her from her daily stresses and stressful thoughts. Comments made by this participant that reflected this include:

> [Exercise] has been like a saviour for my, my sanity if you put it that way…I don't know whether I would have quite survived without it, umm, initially when I was, when I was really stressed out. I felt that the park was my savior [*participant laughs a little*]. It was my place to go, umm, for myself, and to try and stress out a bit…I [walk] to the park to de-stress…otherwise I'd go stupid I think [*participant laughs*]" (Amy);
>
> It [walking] settles me down more. And as I said I've made myself become aware of what's going on in the park. Ah, we'll meet a couple of dogs that the

> dog knows, and I talk to them. Ah, there's birds, various birds, umm, they're nesting. And I ah, take notice of those…so generally it's sought of a settling down time for me (Amy).

Furthermore, this participant highlighted that one of the reasons why she walked was "just to be aware of what's around me. Because when, when you do get stressed out you forget about looking at things" (Amy). She referred to one particular time when she "could feel the stress levels, umm, accelerating, but by the time I [walked] half way round [the park], I, I felt better, I used the breathing as much as I could" (Amy).

Break from daily routine. Doing something different from one's daily routine was a facilitating factor shared by five participants. Specifically, three of these women used exercise as a way to get out of the house. For example, one participant said she walked "just to go out of the house, not always doing the same things, ah, a bit of fresh air, a bit of change of, change of atmosphere" (Vicki). Similarly, another participant said "I am walking all the time because I want to make sure I get out" (Donna). Furthermore, for one participant walking "gets [her] up and out", and provided her with "something to do" (Monica).

Using exercise as a time for oneself was shared by two participants as a way of breaking their daily routine. For example, one participant said "I don't have to have music or anything like that. I feel that I can entertain myself with whatever is in my head. I never have this time to think. You always have your day-to-day things and obligations, but no-one ever gets to sit and think about things" (Jane). For this participant, walking allowed her "time out" from her daily routine to think.

Instrumental physical activity. This GD reflects participating in PA as a means- to- an- end, rather than an end-in-itself, and a beneficial consequence of living

an active lifestyle. It contains one second-order and one first-order theme (with the same label): instrumental facilitators to PA.

Instrumental facilitators to physical activity. Instrumental facilitators to PA to which participants referred, which indicated their PA behaviour was a consequence of living an active lifestyle, included playing with grandkids, looking after their dog, active housework, and the reliance on active modes of transport. For example, two participants described their grandchildren as being motivating factors that keep them active. One participant said that she would "rather be out playing with the grandkids", and that "[her] little grandkids going "come on nanna play" (Belinda) is what motivates her to engage in activity with them. For this participant, it was evident through her voice tone and emotion, that being with her grandchildren was an important part of her life. The value of sharing time with grandchildren was also stated (with emotion) by another participant. For example, she said "[playing] with the grandchildren. They keep me going" (Betty). This participant also commented:

> I would do things because I had to do them. I use to force myself to get up. If I had the grandchildren they sort of keep you on your toes I suppose, but if I was on my own I used to say to my husband I would get up and go to the toilet, come back and sit on the bed, get my clothes out to get dressed and I could sit there for half an hour just staring out the window. I just couldn't be bothered (Betty).

A common factor shared by two participants was having a pet dog. For these participants, ensuring their dog received its daily PA also meant they remained active. For example, one participant mentioned "the dog sits there and looks at me until I take him [for a walk]! [*participant laughs*]" (Amy).

One participant ardently detested exercise. She said “if it’s a must or necessary I will do it, but otherwise if it’s not I will avoid it”. Therefore, this participant did not engage in exercise other than what was required as part of her treatment, in terms of lifestyle. She commented “you do every day what was daily life requires you to do and see what happens” (Kate). Lifestyle PA was a preferred mode of PA shared by most participants.

Active transport was another factor repeatedly reported by one participant as being her main PA facilitator. This participant stated “I happen to live away from the shops, so I have to walk…I don’t drive a car…it’s a bonus that I have to walk” (Monica). Therefore, walking for this participant was a means-to-an-end.

The positive role of others. This GD refers to positive influences other people had on facilitating participants’ PA behaviour. It includes three second-order themes: company/socialising, social support/encouragement, and comparativeness.

***Company/socialising*.** This second-order theme contains one first-order theme, labelled group exercise/socialising. Nearly all participants were highly motivated by the social elements of exercise, and being in the company of others. Exercise provided them with a chance to interact socially with other people. For example, one participant said she attended a group exercise program “because it got me out and socialising with more people” (Jen). Similarly, another participant stated “I enjoyed it [exercise] because it got me out and to talk to somebody else” (Jen). Another participant talked about her past experience of loneliness as the reason why she now preferred to exercise with others:

> Because all my life I’ve been alone…that is why I look forward to going out but not on my own. If there is a group, I will go…If I have a group to go to I look forward to that (Kim).

Social support/encouragement. This second-order theme is about receiving support and encouragement from significant others about one's PA behaviour. This theme also includes the facilitating impact of seeing other people exercise, or being a positive role model for other peoples' PA behaviour. It contains two first-order themes, labelled support (spouse/others, including doctor), and positive role model (self and others).

Support (spouse/others, including doctor). Four women talked about the importance of spouse, family, and others' support in maintaining their PA participation. For example, one participant commented "I suppose you would be inclined to do something with somebody else doing it egging you on" (Jen). Similarly, another participant said "You need [support] from your husband. My daughter is very supportive of me. She will boost my morale…" (Kim). For another participant, the significance of family support was reflected in her statement:

> The [family] know the health effects of what I've been living with and they are all very keen for me to [exercise]. It's not push though. It's sort of suggestions like my daughter with this vibrating machine. And she was very keen so we went out and looked for it right now. So we went to Rebel Sport and they didn't have it. So we went to another one and they didn't have it so it sort of took off the push to get it. So we are still keen about it (Jane).

Additionally, four women indicated encouragement and advice from the doctor who addressed their diabetes, increased their confidence, provided guidance, and assisted them in monitoring their health and PA behaviour progress. Consequently, that doctor played an important role in these women's PA behaviour:

> He [doctor] told me already. He told me you'd better walk again…and then winter came and I had to start walking because I was going to see him again.

> Oh my goodness! I had to lose 2kg and he will be happy!...he said that I had to start walking. So I am just walking (Donna);
>
> I am actually going up [to doctors] for a review on the 28th and then we are going to start the aqua aerobics. Well once a week to start with and then he [doctor] will bump it up once I get more fitness (Jane).

Positive role model (self and others). For one participant, being a positive role model to her children, and the influence of other role models, facilitated her PA involvement. This participant talked passionately about the importance of setting a good example for her children, and with reference to exercise, said "my daughter is putting on a bit of weight and I want to show her by example what we can do" (Jane). This participant also spoke about the influencing role that someone else had on her PA behaviour. An example of a comment she made that reflected this was:

> I didn't pull off the weight like she did but I thought if she could do it I could and then I thought why am I walking around the [clothes] line. Surely there is somewhere else to go. That's when we started doing walks around the block. But I thought this woman just got up and walked around her line! (Jane).

Therefore, being a role model, and seeing influential role models in others' was a significant facilitator in this participants PA behaviour.

Comparativeness. Comparativeness was the next second-order theme and it was also the label given to the only associated first-order theme. Making comparisons with other people was a common motivating factor shared by three participants. For these women, comparing their PA level with others, and/or their desire to be doing more PA than somebody else, was a motivating factor to their PA engagement. For example, one participant said "you meet other people, you know, you see how some people are better than you, so often that motivates me a bit you know, it gets me to do,

you know if I can do some a bit better then is good as they (*sic*), or a little bit better" (Vicki). Another participant commented:

> I think that there is a competitive edge to a lot of things. When my husband goes out and goes on the bike I want to too. For some reason I think he's getting fit and I want to...so that is a motivator for me as well (Jane).

Discussion

In this study, I aimed to explore the barrier to and facilitators for PA among 11 overweight (BMI ≥ 25) women with T2DM and depression (as determined by a HADS-D score ≥ 8). Overall, findings from this qualitative study were consistent with previous research in similar populations, such as people with T2DM (Casey, De Civita, & Dasgupta, 2010; Dye, Haley-Zitlin, & Willioughby, 2003; Korkiakangas et al., 2009; Lawton, Ahmad, Hanna, Douglas, & Hallowell, 2006; Mier, Medina, & Ory, 2007; Van Roojin, Rheeder, Eales, & Molatoli, 2002), people with CHD (Cooper, Jackson, Weinman, & Horne, 2002; Rogerson, 2009), overweight individuals (Jewson, Spittle, & Casey, 2008; Struber, 2004; Larsson, 2004; Larsson & Mattsson, 2001) and people experiencing depression (DS: Craft, Pernal, Freund, & Culpepper, 2008; and CD: Faulkner & Biddle, 2004; Seime & Vickers, 2006; Ussher, Stanbury, Cheeseman, & Faulkner, 2007). The results of the present study indicated that no single barrier or facilitator alone could account for every participant's PA behaviour, and the combination and strength of the reported barriers and facilitators differed for each individual. Nevertheless, there were some shared barriers and facilitators. In the following paragraphs, I discuss the main PA barriers and facilitators, and relationships between factors, which were reported by participants; and highlight implications for health professionals aiming to promote PA in this population. I then acknowledge methodological issues and potential areas for future research, and suggest PA strategies

and an intervention approach that seem appropriate for increasing PA among overweight women with T2DM and depression.

Barriers to Physical Activity

Health limitations. Experiencing one or more health problems was a noted PA barrier for participants in this study. This finding is not surprising, considering women in this study were likely to be experiencing more than one chronic condition in addition to their weight and T2DM. It is an important finding nonetheless, because it demonstrates having multiple health conditions can be detrimental for adopting and engaging in healthier behaviours, including exercise. For example, being overweight or obese was a hindrance to PA expressed by most women, and it was evident in participants' speech, voice tone, and facial expressions that the associated physical restrictions made exercise an unpleasant experience. One participant acknowledged she has slowed down because of her weight; another participant described her "overhanging stomach" jostling around while exercising, which caused nauseous feelings and discomfort. Previous research has also found excess body weight to be a barrier to PA, particularly among women (Ball, Crawford, & Owen, 2000) and people with T2DM (Mier et al., 2007; Safford, Russell, Suh, Roman, & Pogach, 2005; Shultz, Spraque, Branen, & Lambeth, 2001; Swift, Armstrong, Beerman, Campbell, & Pond-Smith, 1995). For example, Ball et al. (2000) analysed cross-sectional self-report data from a representative population survey of 2,298 Australian adults (aged between18 and 78 years; 53% were women). In their study, "being too fat" was a common barrier to PA for overweight individuals, more so for women than men (6.2% vs. 2.2%, respectively; Ball et al., 2000). Furthermore, obese participants were significantly more likely to indicate their weight as a barrier, compared to those who were overweight, or acceptable/underweight (22.6% vs. 5.35% vs. 0.7%, respectively).

Similarly, in addition to overweight and T2DM, experiencing at least one other chronic health problem (e.g., cancer, arthritis, high blood pressure) or ailment (e.g., back, leg, or foot problems), and the associated pain, was a significant barrier for most participants. This finding coincides with previous research which also reported health problems and pain to be common exercise barriers for older adults (Jancey, Clarke, Howat, Maycock, & Lee, 2009; Schutzer & Graves, 2004), and people with T2DM (Korkiakangas et al., 2009; Shutlz et al., 2001; Wanko et al., 2004; Dutton et al., 2005; Searle & Ready, 1991).

Although not clinically diagnosed, depression was recognised by nearly all participants in the present study as a significant barrier to PA participation and adherence. Most participants indicated they would be more likely to opt for a sedentary activity (e.g., sleep, read a book, watch TV) when they were feeling depressed. In most cases, depression affected participants in all areas of their life, not just their PA behaviour. For example, one participant (who described herself as a "people person") said when she was experiencing a high level of depression she lacked the drive to find employment, and had no desire to talk to her neighbours. The inhibiting influence of depression on the PA behaviour of women in the present study corresponds with outcomes from other qualitative (Faulkner & Biddle, 2004), and quantitative (Seime & Vickers, 2006; Ussher et al., 2007) research involving people with CD, and quantitative studies examining the influence of depression among women (Craft Perna, Freund, & Culpepper 2008), people with Type 1 diabetes (Kyrios, Nankervis, Reddy, & Sorbello 2006), and people with T2DM (Vickers, Nies, Patten, Dierkhising, & Smith 2006).

Influence of depression on other reported barriers. It is important to acknowledge that for discussion purposes, I am presenting the reported PA barriers as

separate factors. It is likely, however, that a complex relationship exists among these factors, further impacting on individuals' inactivity. Thus, it is unlikely that a single barrier can be identified as being the main cause of inactivity for participants in the present study. For example, it was evident that although depression was an independent barrier in its own right, being depressed was also intertwined with other reported barriers, including physical health problems (particularly weight) and associated pain, physiological limitations (e.g., tiredness, low energy), lack of motivation, low self-efficacy, perceived fewer opportunities to exercise, and social support.

The influence of depression on other reported barriers has also been noted in previous research (Craft et al., 20008; Kyrios, Alahuhta, & Laitmen, 2006). For example, Kyrios et al. (2006) found that in a sample of outpatients from the Royal Melbourne Hospital (30 women and 20 men; median age 34 years), compared to those without depression (assessed using a BDI score $\geq$ 10) participants with depression (e.g., reporting depressive symptoms, such as a negative physical self-concept, lower self-efficacy, feelings of hopelessness) were less adherent to self-care behaviours, such as exercise. Also, those with depression acknowledged a greater number of barriers, and experienced these barriers more frequently (Kyrios et al., 2006). Furthermore, in line with Bandura's (1977, 1982) self-efficacy theory, Seime and Vickers (2006) suggested that people with depression are likely to focus on their barriers, which leads to a lowered exercise self-efficacy, and a greater likelihood of relapsing back into previously sedentary habits (Seime & Vickers, 2006). Perhaps this was also the case in the present study. Given the hindering direct and indirect effect of depression on PA behaviour, participants with higher levels of depression may have been more likely than those with a lower level of depression to perceive and focus on their barriers,

which likely facilitated a lowered self-efficacy, and greater tendency to be physically inactive. This increased risk of inactivity for overweight women with T2DM and depression is problematic, particularly considering that physical inactivity, especially when combined with other unhealthy, and highly correlated, behaviours (e.g., smoking, alcohol drinking, poor diet), can increase mortality risk four-fold (equivalent to 14 years in chronological age; Khaw et al., 2008). This figure was based on men and women (aged 45-79 years) from the Norfolk general population (Khaw et al., 2008). Thus, mortality risk might be even higher for people with multiple health problems (e.g., overweight, T2DM, and depression).

Weight status and depression. A lot of participants in the present study emphasised a particular negative relationship between their weight status (overweight or obese) and depression, which inhibited their PA participation. For example, being overweight made them feel depressed, which, in turn, contributed to their physical inactivity. Consequently, their low level of PA probably further facilitated weight gain and depression, and thus inactivity. One participant said she found it very difficult to exercise because of her weight, enhancing her lack of motivation, low self-efficacy, and depression. She described this relationship as a “hopeless situation”. Evidence of the negative association between excess body weight and depression, particularly on participants’ PA level, is concerning, and corresponds with numerous studies identifying female gender, and experiencing at least one chronic health problem, as risk factors for depression within the overweight population (Friedman & Brownell, 1995; Stunkard, Faith, & Allison, 2003), as well as with research outcomes demonstrating overweight and depression to be risk factors for inactivity (ABS, 2009). At any rate, this finding underscores the importance of ideally preventing, and/or reducing depression as part of effective diabetes management, particularly among

overweight women. Regular participation in PA has numerous psychological (e.g., reduced depression), and physical benefits, and is considered a key component of diabetes and weight management (Castaneda, 2004; Wing & Phelan, 2005), and depression management (McPhail, 2006).

Therefore, a key challenge for researchers is determining effective ways to assist overweight women with T2DM and depression to maintain PA, even more so during periods of higher levels of depression. For promoting PA (and simultaneously reducing depression) among women with depression, Craft et al. (2008) proposed that exercise interventions should incorporate exercise counselling focusing on identifying and reducing barriers to exercise, and interventions should involve strategies enhancing feelings of self-efficacy and social support. Similarly, outcomes from the present study suggest that a psychological intervention, such as a counselling approach, seems appropriate for overweight women with T2DM and depression. This proposal remains speculative, however, and the efficacy of counselling-style interventions is an important area for future inquiry. The suitability of a PA consultation approach for this population is discussed in a later section of this chapter.

Psychological benefits and weight loss (extrinsic motivation). In addition to the negative link participants made between their weight and depression, a large proportion of participants commented that the psychological benefits they experienced from participating in PA were related to losing weight. This finding is consistent with the outcomes of King, Taylor and Haskell's (1993) randomised control trial involving adults aged 50 to 65 years. King et al. (1993) found reduced depression in their study sample was related to weight loss (from exercise), not fitness improvement (King et al., 1993). Most women in the present study frequently made reference to exercise as a tool for their weight loss, which is not surprising, because most (eight) women were

not just a bit overweight, but were obese (WHO, 2009c); and weight loss is a well known benefit of regular PA (Pi-Sunyer et al., 1998). This finding has important implications for researchers and health practitioners aiming to promote PA participation and adherence in overweight women with T2DM and depression. Specifically, according to Deci and Ryan's (1985) self-determination theory (SDT), compared to people who exercise for extrinsic reasons (e.g., weight loss), intrinsically-motivated people are more likely to adhere to PA, and have less chance of relapse back into sedentary habits. For example, in a study conducted by Thogersen-Ntoumani and Ntoumanis (2006), involving 375 exercisers from 10 health clubs in England, individuals with self-determined (i.e., intrinsic) motivation for exercise were significantly more likely to be in the maintenance SOC, and report fewer cases of exercise relapse, than individuals who exercised predominately for extrinsic reasons (Thogerson- Ntoumani & Ntoumanis, 2006). Intrinsic motivation is also associated with enhanced psychological well-being and greater self-efficacy, whereas extrinsic motivation is related to lowered psychological well-being (Frederick-Recascino & Morris, 2004; Jouper, & Hassmen, 2008; Thogersen-Ntoumani & Ntoumanis, 2006). Therefore, despite the associated well-being benefits experienced from weight loss that were expressed by some women, in the long term, focusing on exercise as a weight loss tool may increase their risk of relapse back into sedentary behaviour, and failure to adhere to an exercise program regimen may lead to, or enhance already existing, depression. Therefore, to promote PA participation and adherence and enhanced mood, strategies that foster intrinsic motivation seem important for overweight women with T2DM and depression. Such strategies include education on the numerous health benefits of PA, regardless of weight loss (Blair & Church, 2003); identifying and encouraging types of activities the individual enjoys or might like to try; and goal

setting (particularly process-oriented goals). With regard to goal setting, research findings typically indicate that intrinsic motivation, and adherence to PA, are related more to the process of performing the activity, rather than the product or outcome of the activity (e.g., weight loss; Berger, Pargman, & Weinberg, 2007). Therefore, it may be more appropriate to encourage women who are overweight to make process-oriented goals (e.g., increasing the number of minutes engaging in the activity), rather than extrinsic (outcome) oriented goals (e.g., weight loss), at least in the initial stages of behaviour change. Intervention research is needed to examine the effectiveness of these strategies in promoting PA participation and adherence among overweight women with T2DM and depression.

Furthermore, the association between weight loss and well-being expressed by women in this study act as a valuable reminder for health professionals aiming to promote PA participation among this population: the importance of being aware of the motive behind their clients' PA participation (e.g., weight loss), and the root of any derived psychological benefits from PA (e.g., whether the motivation is primarily extrinsic in nature, such as weight loss, or intrinsic in nature, such as enjoyment). This information will assist health professionals in providing their clients with appropriate information about the benefits of PA, and ensure that clients' PA goals are optimising (intrinsically motivated goals), rather than hindering (extrinsically motivated goals), their long term PA participation and well-being, and thus diabetes management.

Lack of motivation. As previously mentioned, most participants indicated a lack of motivation to engage in PA. Low motivation is a symptom of depression, and has been found to be a PA barrier among people with depression (e.g., Craft et al., 2008). The extent to which participants' low motivation stemmed from their depression is unknown, however, because low motivation is also a reported PA barrier

for people in the general population (Dishman, Sallis, Orenstein, 1985), those who are overweight (Jewson et al., 2008; Struber, 2003), and individuals with T2DM (Casey et al., 2010; Kirk, Barnett, & Mutrie, 2007), who are not depressed.

The majority of women indicated that other priorities, including attending doctor appointments and family commitments, prevented them from engaging in PA. This finding is not surprising. For example, with regard to attending doctor appointments, individuals with multiple health conditions, such as women in the present study, require numerous medical interventions/management regimens for their illness, which likely involve regular routine check-ups from one or more health professionals (e.g., diabetes specialist, podiatrist, cardiologist, ophthalmologist; Aschner et al., 2007). Therefore, finding time to engage in PA may be an additional behavioural burden on their lives. Furthermore, the majority of women expressed family as a dominant factor in their daily life, and "house duties" was a commonly reported occupation. It is then probable these women viewed such commitments as a higher priority than other (less desirable) activities, such as PA. Research findings also suggest family commitments are a main PA barrier for people in the general population (Salmon, Owen, Crawford, Bauman, & Sallis, 2003), those who are overweight (Jewson et al., 2008), and for women (Ansari & Lovell, 2009; Errickson & Gillespie, 2000; Nowak, Rakzinska, & Rynkiewicz, 2009). For example, in Errickson and Gillepsie's (2000) study, the majority of women who dropped out of their exercise and wellness program were mothers. To them, family was a top priority, over and above adhering to the program. Similarly, Nowak et al. (2009) examined correlations between ways of spending free time and work-related and family duties among 1,104 women (aged 20-75 years) taking part in physical recreation exercise. Outcomes showed the main PA barrier was other commitments, particularly work-related and

family-household responsibilities. Furthermore, Nowak et al. highlighted that PA participation is not about how much free-time a person has; rather, it is about choice and priority. Therefore, in light of the present study findings, tending to other commitments suggests that, for these participants, PA was a low priority. In particular, this could be because exercise often involves considerable discomfort for these women, given their physical (e.g., overweight) and physiological (e.g., low fitness) health status. Thus, this finding has important practical implications for researchers and health professionals aiming to promote PA participation among overweight women with T2DM and depression. Specifically, it suggests that strategies for enhancing PA as a priority are important, such as encouraging women to participate in types of PA that they enjoy, and that are conducive to their current fitness and health status. In addition, it is important to devise a realistic and achievable PA plan that fits into their daily routine and other commitments.

Effect of past sedentary behaviour. Limited childhood experiences of engaging in PA, leading to a lack of interest and experience related to PA was a barrier discussed by several participants. When I examined the underlying reasons for participants' limited childhood experiences, one mentioned that she has simply never been interested in PA, and two talked about their negative (or lack of) parental support inhibiting participation. This latter reason is consistent with outcomes from Thompson, Humbert, and Mirwalk's (2003) 25-year longitudinal study. Specifically, Thompson et al. found that, unlike regularly active women, inactive women primarily recalled the negative influence of their parents on their childhood PA behaviour (e.g., lack of encouragement or not allowing PA participation), which affected their current activity level (Thompson et al., 2003). The influence of negative past experience on current lack of PA for some women in the present study also coincides with the perceived

behavioural control (PBC) arm of Ajzen and Madden's (1986) Theory of Planned Behavior (TPB). Briefly, the TPB postulates that human action is determined by three factors: one's attitude toward the target behaviour (in this case, PA); the perceived social pressure (subjective norm); and the ease or difficulty with which one can perform the behaviour (PBC), which, in part, reflects past experience. The combination of these three factors leads to the formation of one's intention to perform or not to perform the target behaviour (Ajzen, 1991; Miller & Miller, 2010). For participants in the present study, negative past experiences might have contributed to an unfavourable attitude toward PA and, a lowered PBC, with the result that these women experienced low levels of intention to engage in PA. Moreover, negative past PA experiences could have diminished their self-efficacy, that is, confidence in their ability to be physically active. Taken together, these findings highlight the possibility that in addition to recent PA history, experiences during people's childhood may also affect their current PA intention and participation. Therefore, to enhance PA intention (and thus participation) among overweight women with T2DM and depression, findings from the present study suggest flexible, tailored psychological interventions are needed that enable the identification of barriers stemming from negative PA experiences during childhood.

Environment. Some participants in the present study mentioned external/environmental barriers, such as poor weather, lack of transport, unsafe neighbourhood; and lifestyle-related barriers, such as lack of money, prevented their participation in regular PA. These reported barriers have also been found to be prominent PA barriers for people in numerous studies in the general population (Chin, White, Harland, Drinkwater, & Raybould, 1999; Salmon et al., 2003) in people with T2DM (Casey et al., 2010; Korkiakangas et al., 2009; Mier et al., 2007), and in those who are overweight (Struber, 2004). Strategies focusing on educating women about

different PA types (e.g., those that do not require money, transport, and/or being outdoors) seem appropriate for this population.

Only a few participants indicated a lack of social support as a barrier to their PA participation. Nonetheless, this was a prominent barrier for these women. For example, for one woman, receiving little encouragement from her spouse was a PA barrier, and for another woman, a lack of support from fitness staff and other gymnasium patrons was an inhibiting influence on her PA participation. Outcomes from previous research also suggest that little support from external sources is a main PA barrier for people in the general population (Rhodes, Martin, Taunton, Rhodes, Donelly, & Elliot, 1999), for those who are overweight (Struber, 2004), and for people with T2DM (Casey et al., 2010; Kirk et al., 2007; Korkiakangas et al., 2009). Furthermore, the influence of social support on PA behaviour appears to be more prominent in females than males (Ansari & Lovell, 2009; Errickson & Gillespie, 2000).

As previously indicated, for at least one participant in the present study, a lack of support was probably intertwined with experiencing depression. For this participant, loneliness and social withdrawal might have resulted in fewer opportunities for receiving social support and encouragement. This finding is consistent with previous research involving people with CD (Ussher et al., 2007) and women with DS (Craft et al., 2008). For example, Ussher et al. (2007) reported that among people with severe (clinically diagnosed) mental illness, lack of regular contact appears to be a common reason for their inactivity. It may be that the woman in the present study, whose lack of support appeared to stem from her depression, was experiencing a greater level of depression than most participants. The following comment made by this participant further suggested this: “I had to see a psychologist for three years. I was very bad”.

Findings from the present study suggest that psychological interventions aiming to promote PA among overweight women with T2DM and depression, particularly those with a severe level of depression, should include strategies that focus on enhancing opportunities for social support and encouragement.

Facilitators for Physical Activity

To improve health. On a positive note, improving one's physical, physiological, and psychological health was a major catalyst for participants' PA behaviour. All participants were aware of the pivotal role regular PA plays in the management and prognosis of their T2DM, weight management, and additional physical health benefits. Interestingly, although all participants referred to the psychological well-being benefits they received from engaging in exercise, very few indicated they engaged in exercise as a specific means of managing (or reducing) their depression. Perhaps participants lacked knowledge regarding the benefit of PA as a method of reducing depression. For example, one participant said that before participating in this study, she had never made the link between her depression and lack of exercise. Additionally, she acknowledged that her sedentary lifestyle prevented her from experiencing any associated psychological benefits of PA. Therefore, for this participant, PA was an unlikely method of depression reduction. On the other hand, participants may not have specifically engaged in exercise as a means of managing or reducing their depression, because women were not clinically diagnosed with depression. Thus, they may not have been consciously aware that they were experiencing at least a mild level of depression. Consequently, although participants achieved well-being benefits from exercising (which, as previously discussed, were likely, in part, associated with weight loss), they may have only considered PA to be playing a role in managing their physical health problems. Nevertheless, just over a

third of participants used PA as a way of adding variety into their typically repetitive daily routine, which they acknowledged contributed to their psychological well-being. Examples included walking to and around the shops, walking to the park, and attending hydrotherapy classes. This supports Bahrke and Morgan's (1978) Distraction Hypothesis as a mechanism for explaining the derived psychological benefits from PA. Specifically, this hypothesis suggests that PA can serve as a useful "time out" from a person's usual daily routine. Thus, if a person's usual daily tasks are stressful or (in the case of most women in the present study), mundane, then exercise can lead to improved psychological health by providing a distraction from usual daily life tasks (Daley, 2002; Netz, 2007). At any rate, regardless of whether participants were consciously using PA to derive psychological benefits, engaging in PA did contribute to participants' enhanced well-being. These findings have important practical implications for health professionals aiming to promote PA and/or reduce depression among overweight women with T2DM and depression: the value of educating clients about, and encouraging participation in, PA for the associated psychological benefits.

Instrumental physical activity. A few participants indicated instrumental modes of activity that facilitated their PA behaviour. These modes included playing with grandkids, walking their dog, lifestyle PA (e.g., domestic chores), and active transport. This is a noted finding because it is likely that women with multiple health problems, such as overweight and T2DM, and associated physical restrictions can only engage in low intensity PA, so they favour these PA types over more physically-demanding types of PA. This finding corresponds with the substantial body of existing research indicating that walking and lifestyle PA are preferred PA types for women (ABS, 2009; Speck & Harrell, 2003), older age groups (ABS, 2009), people with T2DM (Krug, Haire-Joshu, & Heady, 1991), people who are overweight (Adams,

Ananian, DuBose, Kirtland, & Ainsworth, 2003; Andersen et al., 1999), and individuals with depression (Richardson et al., 2005; Ussher et al., 2007). It also reinforces the importance of current PA recommendations that emphasise PA modes other than structured exercise routines (e.g., lifestyle PA; Pate et al., 1995). Thus, in light of the typically low adherence rate to structured, pre-determined PA routines, in order to promote PA participation among overweight women with T2DM and depression, individualised psychological interventions are needed. Such interventions are tailored to suit each person's PA preference and ability.

The positive role of others. Most participants reported the use of PA as a means of interacting and enjoying the company of others. This is encouraging, because women in the present study were experiencing at least two of the following factors that tend to increase the likelihood of social isolation: their age, presence of depression, and occupation type. For example, all women were considered to be in the middle to older age bracket (Spirduso, 1995), and there is a greater likelihood of social isolation for older adults in comparison to younger age groups (Cattan, White, Bond, & Learmouth, 2005). Additionally, all women had at least a mild level of depression, which can further drive people toward social isolation, particularly for those with a higher level of depression. Furthermore, the majority of women indicated an occupation that involves a high probability of social isolation: being retired, home duties or housewife, or unemployed. The encouraging finding that women were using PA as a way of socialising with others supports Deci and Ryan's (1985) proposal within SDT that one of the three basic psychological needs is relatedness (the other two needs being autonomy and competence). Specifically, perhaps the individual's psychological need for feeling connected with significant others was satisfied via their interactions with others while exercising (Deci & Ryan, 2000; Vansteenkiste, Simons, Lens, Sheldon, &

Deci, 2004). The positive influence of social interactions also corresponds with outcomes from Faulkner and Biddle's (2004) qualitative study involving individuals with CD. They too found enjoying the company of other people to be a common motive for PA among their sample (Faulkner & Biddle, 2004). Furthermore, the present study finding corroborates Norman's (1998) recommendation that in order to promote exercise adherence among older adults, exercise classes should actively foster social interactions. Consideration however needs to be given to the finding that not all participants preferred social based PA. For example, as previously indicated, two participants said they preferred individual-based PA (e.g., walking around the park) that allowed them time to themselves, to de-stress and/or think. Moreover, one participant said she felt "out of place" and unsupported exercising in group settings with fit individuals. Similarly, in Miller and Miller's (2010) study, overweight individuals felt intimidated exercising among fit normal weight individuals, likely contributing to their inactivity. Nevertheless, individual preferences in PA type highlight that there can be no "one size fits all" PA that can cater for everyone's needs and preferences (Chao, Foy, & Farmer, 2000; Seime & Vickers, 2006).

Paralleling the positive influence of being in the company of others was the finding that some women indicated that for them, a PA facilitator was receiving support and encouragement, particularly from family members. This is consistent with outcomes from numerous studies that social support is a predominant motivating factor for adults in all population groups, including the general population (De Bourdeaudhuij & Sallis, 2002; Rhodes, Martin, Taunton, Rhodes, Donnelly, & Elliot, 1999), people with T2DM (Korkiokangas et al., 2009; Mier et al., 2007), and women who are overweight (Jewson et al., 2008). Thus, previous and present study findings suggest PA interventions for overweight women with T2DM and depression should be theory

driven, incorporating strategies that foster relatedness, such as opportunities for social support, and self-efficacy enhancement, such as promoting PA choices matched to participants' needs, capabilities, and preference.

In particular, just over a third (four) of the participants in this study indicated that they valued the PA support, advice, and guidance they received from their diabetes specialists, and that this was a motivating factor for them. This finding corresponds with previous outcomes suggesting health professionals play a pivotal role in the initiation and maintenance of exercise behaviour among older adults (Balde, Figueras, Hawking, & Miller, 2003; Booth, Bauman, Owen, & Gore, 1997; Rosqvist et al., 2009; Schutzer & Graves, 2004). For example, in a randomly selected sample of 2,298 Australian adults, Booth et al. (1997) found that among those aged 60 to 78 years, more than half indicated that they wanted PA advice from a health professional compared with 22% of those aged between 18 and 38 years. Sparse qualitative research findings also suggest people with depression value the advice they receive from health professionals, particularly regarding their exercise behaviour (Hathaway et al., 2005, cited in Seime & Vickers, 2006; Faulkner & Biddle, 2004). For example, Hathaway et al. (2005) found that individuals with CD valued the assistance they were given from the health professionals connecting them to the fitness centre. Ongoing support for exercise, accountability, and encouragement were also seen as necessary for their exercise adherence (Hathaway, et al., 2005, as cited in Seime & Vickers, 2006). Therefore, the positive influence that diabetes specialists had on the PA behaviour of participants in the present study reaffirms the potential, yet pivotal, role that health professionals, particularly diabetes specialists, have on the PA behaviour of their clients. Future research is warranted examining ways diabetes specialists can assist overweight women with T2DM and depression in identifying and overcoming their PA

barriers, and enhancing their PA participation. Furthermore, a currently unexplored, nonetheless worthy area of future qualitative research is examining the effectiveness of the PA advice provided by diabetes specialists. Knowledge gained from such research would be valuable in improving the identification of depression, and use of PA for the prevention and treatment of depression among overweight women with T2DM.

As previously alluded to, three participants mentioned that comparing their own PA level and abilities to the PA of others facilitated their PA behaviour. With reference to Bandura's (1977, 1982) self-efficacy theory, it may be that making such comparisons enhanced their self-efficacy (i.e., belief in their ability to engage in the activity particularly when compared to other people's ability and skill level), and therefore their desire to continue engaging in the behaviour. Festinger's (1954) social comparison theory (SCT) provides another explanation. Specifically, SCT purports that comparing one-self to others is an essential part of social life, and social comparisons are a primary influence on how people define, see, and evaluate themselves (Frederick, Havitz, & Shaw, 1994; Mussweiller, 2002). In an exercise context, such comparisons can act as motivators (e.g., via self-improvement, or self-enhancement) or barriers to participation (Frederick et al., 1994). In particular, self-improvement motive offers a likely explanation for current study findings. For example, perhaps these participants made upward comparisons by observing individuals who were fitter and more skilled, which then facilitated desire for self-improvement, thus, motivating further PA participation. Mention must be made of the one participant who said that she was discouraged from gym settings, because exercising around normal weight and fitter individuals (thus dissimilar others') made her feel "out of place". Such feelings of inferiority (relating to physical appearance and physical ability) probably reduced her motivation to be active. This is not surprising, because, at the outset, it is likely that for

overweight women with T2MD and depression, their physical appearance (e.g., weight status) and physical ability (e.g., limitations, and low fitness) result in a high probability of feeling dissimilar to other individuals in gymnasium settings. Frederick et al. (1994) proposed that motivation to attend exercise classes will increase if people perceive themselves to be similar (e.g., physical appearance, physical ability, or both) to typical class participants (Frederick et al., 1994). Present study findings underscore the importance of taking into account the impact that exercise context (and fellow exercisers) can have on the PA behaviour of overweight women with T2DM and depression. Encouraging PA in supportive contexts with similar people exercising might increase the likelihood that social comparisons will motivate, rather than prevent, PA participation.

Methodological Issues

The present study yielded some important insights into the PA barriers and facilitators for overweight women with T2DM and depression. There are however several methodological issues that need consideration. For example, there was an unequal cultural representation in the present study sample. Nearly half of participants were Australian born, and each remaining participant indicated a different birth country (India, England, Turkey, Poland, and Philippines). Johnson (2000) found subtle differences in ethnic barriers to PA amongst people of South Asian origin living in England (Johnson, 2000). Perhaps there were also cultural differences in PA barriers, facilitators, and their effects among this study sample of overweight women with T2DM and depression. One participant (from Turkey) mentioned her cultural tradition of “following in your mother’s footsteps”, which did not involve exercise, as a barrier to her current PA behaviour. Thus, qualitative research involving an equal

representation of women from different cultural backgrounds would be beneficial in exploring the influence of ethnicity on PA perceptions among this population.

Income status of participants in the present study may also have influenced their PA behaviour and perceptions. The demographic form that participants completed in Study 1 did not ask questions regarding income status. A question about participants' occupation status was included on the demographic form, however. Occupation status has been considered a better indicator of income over the long term than is income information collected at any single point in time (Williams & Collins, 1995). With reference to occupation, the majority (eight out of 11) of women indicated their occupation as being home duties, retired, or unemployed, all of which are typically low-income earning occupations. Barrett et al. (2007) found that high-income individuals were more likely than low-income individuals to report high self-efficacy to participate in exercise when tired (Barrett, Plotnikoff, Courneya, & Raine, 2007). Therefore, in the present study, compared to those in a lower income bracket, women with a higher income may have been more inclined to have a positive perception about their ability to exercise, even when faced with barriers, such as tiredness. In turn, this may have influenced their actual PA behaviour. Future research should consider the potential impact of socio-economic status on the PA behaviour of overweight women with TD2M and depression.

An observation that I made during the interviewing process was that participants varied in their perception and interpretation of the term "physical activity". This variation was apparent despite the verbal description of different types and intensities of PA I provided to participants in the interview, and that participants likely had some prior knowledge about different PA types and intensity required for health benefits (e.g., the SPAQ participants completed in Study 1 includes this information).

This observation is consistent with the disparities in the amount of PA participants reported in their SPAQ responses in Study 1, and with findings from previous research examining definitions and interpretations of PA among older women (Tudor-Locke et al., 2003). When I asked participants about their PA behaviour, some participants considered PA to only include structured exercise, and not include incidental lifestyle PA or walking. On the other hand, other participants talked about a variety of PA types they engaged in, including their lifestyle PA (e.g., hanging out washing, cooking, cleaning) and "structured exercise" routines (or lack of). Additionally, participants' perception of intensity level required to achieve the health benefits of PA differed. Some participants discussed their engagement in light-intensity lifestyle PA (e.g., cooking), or walking at a very slow pace as sufficient PA, whereas others had a better grasp on the notion that a moderate-intensity level of exertion required for health benefits. Nevertheless, I believe that I was able to accurately obtain an indication of all participants' PA behaviour, for example, by asking open-ended questions, followed by any additional probing that seemed to be appropriate for further information. At any rate, this observation suggests the need for researchers and health professionals working with this population to be aware of the knowledge about PA and attitude toward PA of their participants/clients. This awareness will assist with ensuring appropriate PA information and guidance is provided to each individual.

The findings from the present study are unique in that they address in-depth the barriers and facilitators for PA, within a population where there is limited current knowledge. A particular strength of the research design was the recruitment procedure used. Specifically, all participants had taken part in the previous study (Study 1, see Chapter 3), and had indicated their interest in voluntarily taking part in future linked studies. Therefore, during the recruitment process for the present study, only those

participants who indicated initial interest were contacted. On the one hand, although this made the recruitment process easier, and perhaps more efficient (e.g., because I had a pool of participants ready to take part in the study), using the same participants from Study 1 may have biased the results of Study 2. For example, having already taken part in the prior study (Study 1) and several contacts with the researcher, participants may have been more inclined to respond in a socially desirable manner (e.g., exaggerate their PA participation) in Study 2 interview. Nevertheless, I believe that this process of selecting willing participants from Study 1 was more of a strength than a weakness for the following reasons: it enabled the recruitment of women from the target population of interest (overweight women with T2DM and depression). Furthermore, although Study 1 and 2 were linked, they were very different studies in terms of the design (e.g., Study 1 involved completing mail-out questionnaires, whereas Study 2 involved undertaking an interview), and focus (e.g., Study 1 was examining the relationship between depression and PA, whereas Study 2 was exploring barriers and facilitators to PA). Moreover, I believe that this process played an important role in the high success rate in recruiting participants (from the target population) for this study. Therefore, I recommend that researchers conducting similar research in future should consider using a similar recruitment procedure to that used in this study. For studies that do not involve a prior linked study, perhaps researchers could gain initial interest from potential participants in other ways, for example, by mailing an invitation letter to people in the target population.

Future Research

In light of the present study outcomes, in this section, I discuss several issues that warrant further research attention. One such issue is the influence of seeing other people exercise (e.g., role-models) on one's PA participation. For example, in the present study, one participant (from Australia) indicated that observing someone else engage in exercise encouraged her to be physically active. According to Bandura's (1986) social cognitive theory, role modelling can influence behaviour by enhancing an individual's sense of self-efficacy. Perhaps for overweight women with T2DM and depression, seeing other people exercise, particularly those who are perceived to be similar to them (e.g., also women, overweight, with T2DM, and/or depression), would facilitate their own PA behaviour. These are speculative statements, yet probable nonetheless. For example, previous research has found that observing others engaging in exercise is associated with increased levels of leisure PA for women, but not men (Bengoechea, Spence, & McGannon, 2005). Additionally, in another study involving women aged 40 years or more, infrequent observation of others exercising in one's neighbourhood was significantly associated with physical inactivity (King et al., 2000). Therefore, further research could explore the extent to which role models influence PA participation for overweight women with T2DM and depression. Also, determining if the impact of role models differs if the observer perceives them to be similar or dissimilar to oneself, would provide valuable information in determining best ways to increase PA participation in this population.

Another interesting topic for future researchers to consider is the impact of exercising in a group with people who are similar to oneself. In the present study, one participant (from Turkey) commented that a culturally-sensitive, group-based PA program, with women from similar traditions would encourage her to be more active.

Another participant mentioned that she felt discouraged exercising in a gym environment with people who were fitter and leaner then herself. These findings correspond with outcomes from previous research which suggest that exercising with similar others has a positive influence on individuals' PA behaviour. For example, Clark (1999) conducted focus groups to examine the barriers and facilitators for exercise among low-income African-American and White adults (aged 55-70 years). Women, but not men, overwhelmingly endorsed group-based exercise, but only if the group consisted of "like" individuals (Clark, 1999). Additionally, Der Ananian, Wilcox, Saunders, and Evans (2006) conducted focus groups to examine the factors that influence exercise participation among 46 individuals with arthritis. In their study, insufficiently active individuals, and nonexercisers, both expressed that an exercise group comprised of similar individuals would increase their confidence to exercise, and thus their participation (Der Ananian et al., 2006). Therefore, learning more about the influence of exercising with people with similar characteristics (e.g., cultural factors, physical characteristics like overweight, and health problems, such as T2DM and/or depression), would assist in the identification and development of tailored interventions designed to increase PA adherence in overweight women with T2DM and depression.

Age differences in motivations for exercise have been found (Frederick & Ryan, 1993; Morris, Clayton, Power, & Jin-Song, 1996), and thus may have been a factor that influenced the resulted obtained in the present study. Specifically, the focus in this study was on exploring the PA barriers and facilitators for women aged between 30 and 70 years (*M* age = 57.7 years), which is considered to be within the middle adult age bracket (Spirduso, 1995). Therefore, women in the younger and older age brackets were not studied. Perhaps the barriers and facilitators for PA might be

different for overweight women with T2DM and depression in younger or older age groups. For example, for younger adults (e.g., aged 18 to 29), physical health problems might not be a main PA barrier, and factors noted to facilitate PA for women in the present study, such as break from daily routine, or advice from ones' diabetes specialist, might not be as impacting on their PA behaviour. On the other hand, for women in older age groups (e.g., aged 70 years or more), physical health problems may be a more prominent PA barrier than that reported by women in the present study; and exercising for health reasons may be a main facilitator for older age women. Although tentative, this proposal seems likely, especially considering the risk of diabetes complications such as vascular complications, physical decline, and CHD increase with age (Chowdhury & Lasker, 2002; Gregg & Brown, 2003). Moreover, existing literature suggests that older adults (aged 50 years or more) are more inclined to exercise for physical health reasons, including treatment of an existing medical condition, to improve fitness, or relaxation; and less inclined to exercise for fun or challenge of participation (Morris et al., 1996; Shuler et al., 2004). Therefore, identifying and comparing PA barriers and facilitators for overweight women with T2DM and depression in different age groups remains an important topic for future researchers to examine. To determine age differences, researchers could include a larger sample of participants, covering a wider age rage (e.g., between 18 and 70 years or more); or similar to the present study, target individuals within a specific age rage (e.g., aged 18-29, or aged 70 years or more). Outcomes from research examining barriers and facilitators for PA among overweight women with T2DM and depression in other age groups would assist with identifying effective age-appropriate interventions for increasing PA behaviour and reducing depression in this population.

The risk of physical inactivity is very high for overweight women with T2DM and depression, because each female gender, overweight, T2DM, and depression are all significant independent risk factors for inactivity. Therefore, it is understandable that many participants in the present study identified physical health problems (e.g., stemming from their weight and/or T2DM), and depression, as main factors inhibiting their PA; and exercising to improve physical health, including management of health problems, and psychological well-being, were commonly reported facilitators for PA. The extent to which each of these physical inactivity risk factors (i.e., female, overweight, T2DM, and depression) impacted on participants' PA behaviour however, is unknown. Because of the present study purpose, I did not directly ask participants to elaborate on the influence of each of these four factors in isolation, or the relative impact of each factor compared to the others. It must be acknowledged that the strong association between overweight, T2DM, depression, and female gender (ABS, 2009; Luppino et al., 2010; Mazuk et al., 2008; WHO, 2009a) may make it a difficult, and perhaps an unrealistic, task to examine the impact of these factors in isolation. This was demonstrated in the present study by the finding that depression was identified to be a PA barrier in its own right, but was also connected with other commonly reported barriers (e.g., physical health limitations and low self-efficacy). Nevertheless, considering the high risk of physical inactivity and importance of regular PA, for this population, this is an important topic that warrants further research attention. For example, to carry out such investigation, perhaps future qualitative researchers could specifically ask participants about the influence that each of these four factors has on their PA behaviour, and the relative impact of each factor. Clearly, outcomes from such research would assist with identifying effective strategies for increasing PA among overweight women with T2DM and depression.

Additionally, an interesting topic for future research to explore is the impact of depression symptom severity on the PA behaviour for women in this population. As mentioned, previous research and present study outcomes highlight depression to be a significant barrier to PA. There is also research evidence to suggest that a continuous linear relationship exists between the severity of depressive symptoms and poor adherence to exercise (Gonzalez et al., 2007). For example, Gonzalez et al. (2007) investigated the association between depression (using the 10-item Harvard Department of Psychiatry/National Depression Screening Day Scale [HANDS], measured as both a continuous symptom of severity, and as two categories labelled "unlikely major depression" and "probably major depression") with self-care behaviours in T2DM, such as exercise, in 879 primary care patients with T2DM. An important finding from their study was that symptoms of depression were incrementally related to poorer self care behaviours, including lower adherence to exercise. That is, for patients with T2DM, even a mild level of depressive symptoms was associated with important decrements in self-care, and these risks were greater for patients with increasing depressive symptom severity. Perhaps this was also the case for participants in the present study. For example, it may be that women with a higher level of depression were more likely to perceive and focus on their PA barriers, and found it harder to initiate or maintain regular PA than women with lower levels of depression. Additionally, the level of depression may have influenced the factors which participants identified as being facilitators for their PA. Therefore, these remain important questions for future researchers to consider. Knowledge gained from this type of research would provide valuable insight into the barriers and facilitators for PA among overweight women with T2DM experiencing varying levels of depression severity. Furthermore, this information would help researchers and health professionals

aiming to increase PA among this population, to determine if tailored strategies and intervention are needed to assist the needs of women experiencing different levels of depression severity, or, if the same strategies and intervention is suffice, regardless of depression severity.

Appropriate Physical Activity Strategies and Interventions for Overweight Women with T2DM and Depression

There is little research or description about the particular strategies or optimal interventions to enhance PA participation and reduce depression among overweight women with T2DM and depression. Learning more about the strategies used, and the success of interventions in aiding PA participation and adherence would be a valuable direction for research, informing researchers and health practitioners of the most relevant and successful strategies to be included in PA interventions for this population. Outcomes from this study, in conjunction with previous research outcomes, suggest useful strategies for promoting PA behaviour among this high-risk population for inactivity are those that facilitate intrinsic motivation and PA self-efficacy. These include identifying and overcoming PA barriers; education (e.g., PA recommendations, types, and benefits, particularly psychological in nature); goal setting (emphasising realistic, process-oriented goals); identifying and encouraging activities the individual enjoys; identifying and encouraging opportunities for social support; and providing support and encouragement. All of these strategies are key components of an individualised psychological intervention, labelled PA consultation, designed to enhance PA participation among people wanting to become active (Kirk et al., 2007). See Chapter 2 (literature review) of this thesis for further details on PA consultation. Whether a PA consultation intervention, and associated strategies, is an appropriate intervention to promote PA participation and adherence, and thus reduce depression

among overweight women with T2DM and depression is unknown, and requires research attention.

Summary

The present study provides an in-depth analysis of previously unexplored experiences of PA for 11 overweight women with T2DM and depression. Throughout this chapter, I have identified numerous barriers that may need to be addressed and overcome, and facilitators that should be promoted in order to encourage the adoption and successful maintenance of PA among this population. Specifically, outcomes of the present study indicate that psychological interventions aiming to promote PA participation and adherence among overweight women with T2DM and depression should include strategies that address PA barriers, such as having multiple health conditions and associated limitations, lack of motivation, lack of exercise opportunity, lack of social support, and effect of past PA experience or the lack of it, and employ strategies that encourage facilitators, such as physical and psychological health improvement, instrumental PA modes, and opportunities to socialise and gain support and encouragement. Findings from the present study therefore suggest a PA consultation intervention would be ideal for promoting PA participation and adherence among this population. Research is needed to examine this proposal. The high prevalence of depression in overweight women with T2DM, and the problem of physical inactivity, particularly for overweight women with T2DM and depression, highlight the importance of the present research.

Chapter 5: Effects of a Lifestyle Physical Activity Consultation Intervention on Physical Activity Participation and Mood among Overweight Women with Type 2 Diabetes Mellitus and Depression

The findings from the qualitative study (Study 2, presented in Chapter 4) provided specific information on physical activity (PA) experiences of overweight women with T2DM and depression. From Study 2, I identified relevant PA barriers and facilitators for overweight women with T2DM and depression. It was also clear that inactivity is a significant problem for this population, and that psychological barriers (e.g., depressive symptoms) play a noteworthy role in their inactivity.

Despite the potential that PA has to have positive effects on diabetes, weight management, and depression, to date, there have been no interventions designed specifically to increase PA participation and adherence among overweight women with T2DM and depression. Recent research, including randomised controlled trials (RCT), have shown promising results of the effect of psychological interventions, particularly based on individualised exercise/PA consultation, for increasing regular PA among people in the general population (Lowther, Mutrie, & Scott, 2002), and those with chronic illness, including cardiac rehabilitation patients (Hughes, Gillies, Kirk, Hillis, & MacIntyre, 2002; Rogerson, 2009), people with Type 1 diabetes (Hasler, Fisher, MacIntyre, & Mutrie, 2000), people with T2DM (Kirk et al., 2001; Kirk et al., 2004; Loughlan & Mutrie, 1995) and those with depression (Richardson et al., 2005). Based on findings from Study 2 of the present thesis, and outcomes from previous studies, a PA consultation intervention may also be effective in increasing regular PA participation for this population. Therefore, the purpose of the current study was to utilise information obtained from Study 2, and outcomes from previous research, to implement an individualised psychological intervention [labelled “Lifestyle Physical

Activity Consultation" (LPAC) intervention] aimed at increasing PA behaviour and adherence among overweight women with T2DM and depression. It should be noted that the LPAC Intervention is consistent with the exercise/PA consultation guidelines put forth by Loughlan and Mutrie (1995) and Kirk, Barnett, and Mutrie (2007), however, for the current study, I added the term "lifestyle". This modified nomenclature was used because previous research and Study 2 outcomes indicate lifestyle PA to be the preferred PA mode for sedentary individuals, people with depression, and those who are overweight. Thus, although the PA consultation is tailored to suit each individual's needs and preferences, promoting a *lifestyle* PA consultation, rather than *PA* consultation may be more appealing to overweight women with T2DM and depression.

The specific aims of this study were to:

- use the information gathered from Study 2 (e.g., concerning the needs, barriers, and facilitators to PA), and findings from previous relevant research, to implement an individualised, psychological intervention (LPAC intervention) to increase self-reported participation in regular PA in overweight women with T2DM and depression;
- gain in-depth knowledge of individual perceptions of the experience of undertaking an individualised psychological intervention (LPAC intervention) to increase regular PA behaviour;
- gain in-depth knowledge of individual perceptions of the effect of PA participation on their mood state (particularly depression); and
- gain in-depth knowledge of individual perceptions of the effect of enhanced mood on their PA behaviour and adherence.

Method

With the aim of understanding in depth the experiences of overweight women with T2DM and depression associated with undertaking an individually-tailored PA consultation intervention, I chose to adopt a case study approach in which a small number of women were followed throughout a LPAC program.

Participants

The present study required a relatively homogenous sample (overweight women with T2DM and depression), therefore, purposive sampling was used (Smith & Osborn, 2007). Specifically, participants were recruited from the sample of women who took part in Study 2, and who expressed interest in taking part in future research. For in-depth qualitative research, such as case studies, a sample size of five or six is recommended (Smith & Osborne, 2003). Thus, participants in this study were six overweight (*M* BMI = 42, *SD* = 11.95) women with diagnosed T2DM, aged between 30 and 70 years (*M* age = 57 years, *SD* = 6.5). To control for the possible confounding effect of TD2M severity, three participants were selected who had been diagnosed with T2DM for 9 years or less, and three participants were selected who had been diagnosed for 10 years or more. In addition, it must be clarified that the initial aim of this study was to sample women experiencing depression (HADS-D score ≥ 8) prior to commencing the LPAC intervention. Thus, because participants were selected from Study 2 (and all participants in that study had at least a mild level of depression) participants Study 2 depression score was used as the initial bases for recruiting the six participants in Study 3. Once the six participants had been selected, and because it had been more than 2 weeks after they completed the HADS in Study 2, participants completed another HADS to get an updated indication of their baseline depression level (i.e., approximately one week prior to commencement of their LPAC intervention).

Analysis of baseline HAD-D scores indicated that two participants fell short of the 8-point criterion. The small sample pool and time constraints prevented the recruitment of an additional 2 participants with at least mild depression. Thus, as displayed in Table 5.1**,** based on their Study 3 baseline LPAC intervention HADS-D score, two participants had no depression (HADS-D score between 0-7), two participants had a mild level of depression (HADS-D score 8-10), one participant had a moderate level (HADS-D score 11-14), and one participant had a severe level of depression (HADS-D score ≥15). The mean HADS-D score (9.50, *SD*= 4.76) was indicative of a mild level of depression. PA was considered safe and appropriate for all participants (as determined by their diabetes specialist). Most participants were from an Australian cultural background; one participant had a Polish background. All participants spoke fluent English.

Tabke 5.1

Participants Baseline Demographic and Health Characteristics

Characteristic	Kelly	Lucy	Mary	Clare	Dianne	Paula
Age (years)	62	62	61	57	45	55
BMI	28	54	30	38	45	57
BMI category	Overweight	Obese class III	Obese class I	Obese class II	Obese class III	Obese class III
Birth country	Australia	Australia	Poland	Australia	Australia	Australia
Occupation	Un-employed	Retired	Home duties	Home duties	Community develop-ment worker	Home duties
Duration of diabetes (years)[4]	10-19	20+	5-9	0-4	0-4	10-19
Depression category	Mild	Mod	No	No	Mild	Severe
Exercise SOC	Prep	Cont	Prep	Prep	Prep	Cont
Depression level	9	12	4	5	10	17

Note. Participant's self-report data obtained from their Study 1 demographic information form; BMI categories defined by World Health Organisation (2006); Duration of diabetes diagnosis based on pre-defined categories used in demographic form; Depression level and categories based on participants baseline HADS-D score; exercise SOC categories (pre-contemplation; contemplation; preparation; action; maintenance) based on participants baseline SPAQ responses.

Design

As mentioned, numerous quantitative research designs, particularly RCT, have demonstrated the effectiveness of PA consultation for increasing PA participation in various populations. In the last 15 years, qualitative research methods have had an increasing and credible presence in the sport and exercise psychology knowledge base (Biddle et al., 2001). Contemporary researchers in the sport/exercise psychology field have recognised that applying diversity in research methods enhances, rather than hinders, the quality and credibility of knowledge gained (Biddle et al., 2001; Munroe-Chandler, 2005). Thus, using a case-study design, I wanted to understand, in greater depth, the experience of women with a complex set of conditions (overweight, T2DM, and depression) in being introduced to PA via participation in a PA consultation intervention (labelled LPAC intervention). A case-study design (Denzin & Lincoln, 1994; Stake, 1994) was used because it allowed me to gain insight into the effectiveness of the LPAC intervention on each individual's PA behaviour and mood, over the intervention period and follow-up. This was achieved by undertaking multiple interviews with each participant, each interview occurring at a key point during the study. Moreover, the design allowed me to compare and contrast each individual's experiences regarding the LPAC intervention, PA behaviour, and mood. Because there are no set guidelines for conducting case-study research, I followed the similar, well cited design of Faulkner and Biddle's (2004) research which involved several interviews over time to explore the influence of exercise on depression in six individuals with clinical depression.

Materials

Various materials were used to monitor participants PA behaviour and mood (particularly depression level) during the 6 months of these case studies. The same

measures used in Study 1 and 2 were used in this study. I chose to use the same measures because participants (who had taken part in the prior studies) were familiar with these measures. Additionally, the SPAQ included questions to assess participants SOC, which I used to assist ensuring the PA consultation intervention was appropriately tailored to each participant's stage of exercise behaviour change. Additionally, a second self-reported PA measure was included in this study in the form of a seven-consecutive day PA log. The log was included primarily for data collection purposes, to provide a more accurate indication of participants' PA participation during the weeks when follow-up calls and interviews were not being conducted and/or when participants were not asked to complete the SPAQ. Furthermore, the decision to include PA logs in this study was also influenced by research that has demonstrated self-monitoring techniques (such as PA logs) to be an effective behavioural strategy for promoting PA in various populations, including adults with T2DM (Ruppa & Conn, 2010).

Demographics. Participants' demographic details were obtained in Study 1 via a short demographic form. The information collected included age, weight, height, birth country, time since diagnosis of T2DM, and any other (diabetes-related and non-diabetes related) health complications. See Appendix F.

Hospital Anxiety and Depression Scale (HADS). A full description of the HADS can be found in the *Measures* section of Chapter 3 (Study 1). See Appendix G for the scale.

Scottish Physical Activity Questionnaire (SPAQ). A full description of the SPAQ can be found in the *Measures* section of Chapter 3 (Study 1). See Appendix H for the questionnaire.

Physical activity (PA) log. I designed a seven-page PA log (one page for each consecutive day). The front page of the log contained instructions for completing the

log; a list of PA examples (organised as home, occupation, conditioning, sport, leisure, and transport activities); and a perceived rate of exertion scale (and an accompanying brief description) to help participants determine whether the activities they engaged in were of at least moderate intensity. Each daily log entry included a space for participants to record the moderate-intensity activities they performed that day, and the duration of each activity. Each daily log entry also included an open-ended question asking participants to describe their mood that day. Additionally, on the seventh day (at the end of the log), there was an open-ended question asking participants to describe any major changes that occurred in their life over the past week. The PA logs were used to gauge participants' PA patterns over a 6 month period. See Appendix P.

Semi-structured interviews. During the course of the study, I conducted three semi-structured telephone interviews with each participant. These interviews, labelled baseline interview, Week 16 interview, and Week 24 interview, were used to gain in-depth knowledge of individuals' experiences of participating in an individualised LPAC intervention to increase their PA participation, as well as the effect of PA participation on their mood and mood on PA. I chose a telephone mode of delivery for these interviews for two reasons: An observation I made in Study 2 was that most participants who were willing to take part in Study 2 found it difficult to travel to Victoria University. Most found the option of conducting the interviews via the telephone more convenient than attending a face-to-face interview. Also, previous researchers who compared face-to-face and telephone interviews reported concordance in participants' responses (Fenig et al., 1993; Korner-Bitensky, Wood-Dauphinee, Siemiatycki, Shapiro, & Becker, 1994; Midanik, Hines, Greenfield, & Rogers, 1999; Rhode, Lewinsohn, & Seeley, 1997).

The baseline interview took place approximately one week prior to the LPAC intervention, the Week 16 interview was conducted 4 weeks after the intervention ended, and the Week 24 interview was conducted 12 weeks after the intervention ended. The baseline interview lasted between 20 and 30 minutes. I developed a general guideline for the baseline interview (See Appendix U). In this interview, I made it clear to each participant that the interviews were not a part of the LPAC intervention (i.e., initial LPAC and two LPAC support phone calls). Rather, my intention was to gather information from participants about their current experiences and behaviour during the intervention. This information was used as a comparison to the information obtained in the remaining two interviews, particularly concerning changes to the participants' PA behaviour and mood following the LPAC intervention.

I developed a general guideline for the Week 16 and Week 24 interviews (See Appendix V). To ensure each participant had the opportunity to talk about their own personal experiences, these guidelines were not rigid. The aim of these interviews was to gain insight into each participant's individual experience about three main topics of interest: their experience of the effectiveness of the LPAC intervention in increasing their PA; their experience of increasing PA on their mood; and the effect of enhanced mood on their PA behaviour and adherence. It should be noted that the available resources (i.e., time and money) for this study allowed for a 6-month study duration. Therefore, the timing of the two follow-up interviews was chosen to allow enough time to determine if participants had adhered to any PA changes in the short-term (i.e., Week 16 interview; one month after the intervention had ended) and long-term (i.e., Week 24 interview; three-months after the intervention had ended). A similar spacing of data collection has been used in other 6-month intervention designs (e.g., Rogerson, 2009).

Examining mood. In the three qualitative interviews I asked participants about their mood. Mood can be defined as a host of "transient, fluctuating affective states", both positive (e.g., feelings of vigour, happiness, satisfaction, and well-being) and negative (e.g., anxiety, anger, and depressive symptoms like feeling down, and experiencing hopelessness, low confidence, and low self-esteem) in nature (McNair, Lorr, & Droppleman, 1971, 1992). Although mood fluctuates, a person can have an impression of their overall mood (e.g., over a period of time). Specifically, in the interviews, I asked participants about their current mood state at the time of that particular interview, as well as their overall mood during the time period since the previous interview. Also, in the Week 16 and Week 24 interviews, I asked participants about their mood during the time period since the initial LPAC. I was particularly interested in gauging changes in participants' mood relating to their PA behaviour, and used probes to elicit further information about any changes. Nevertheless, because mood tends to be undirected and has a variety of internal and external causes (Schimmack, Oishi, Diener, & Suh, 2000), participants often discussed factors other than those associated with their PA participation (e.g., lifestyle, health status) that also either positively or negatively impacted on their mood during these time periods.

The term "mood" was used, rather than "depression" for the following two reasons: I wanted to open up to the possibility of participants talking about factors other than depression (e.g., factors that had a positive or negative impact on their mood); and asking participants about their depression per se may have been somewhat confronting for them, particularly because they had not been clinically diagnosed with depression. Therefore, the term "mood" was considered a more accepting term. Nonetheless, the focus was on participants' depression level.

Participants' qualitative data provided in the three interviews were the main data source. The quantitative measures collected during the study period were used only as supporting documentation to each individual's experiences.

Lifestyle Physical Activity Consultation (LPAC) Intervention

The LPAC intervention procedure was guided by the analogous PA consultation (also labelled exercise consultation) protocols by Loughlan and Mutrie (1995), and Kirk, Barnett, and Mutrie (2007). The 12-week intervention consisted of an initial in-depth consultation (labelled initial LPAC) and two LPAC support phone calls (Week 8 and Week 12 post-initial LPAC). Face-to-face was the delivery mode for most initial LPACs, apart from one telephone LPAC with one participant who was unable to attend the scheduled consultation time and location. The content of the intervention was tailored to suit the individual's PA stage of change (SOC), taking into account both the general principles of PA consultation and the specific results found in Study 2, as reported in Chapter 4. As a basic guide, the content of the initial LPAC included the following strategies: a discussion of PA recommendations (e.g., for health benefits, including diabetes and weight management); benefits of regular PA (e.g., opportunities to socialise, enhanced well-being, and improved physical health. To avoid unrealistic goal expectations, I placed less emphasis on weight loss); participants' current PA behaviour; advantages and disadvantages of PA behaviour change (also known as decision balance strategy); recognising and overcoming individual barriers to PA; participants' activity likes and dislikes; identifying participants' current and potential social support sources (e.g., family and friends, group exercise class participants, health professionals); goal setting (e.g., identifying and writing down 1-, 3-, and 6-month PA goal/s); and relapse prevention (e.g., forecasting triggers or risky situations that may

cause a lapse in their PA, and identifying ways to prevent these lapses or minimise their impact if they did occur).

Another strategy used during the intervention was enhancing self-efficacy. Self-efficacy is a person's belief about their ability to successfully carry out the target behaviour/task (Bandura, 1977). One technique that I used to enhance self-efficacy was increasing the participants' confidence in their ability through mastery experience. For example, in the initial LPAC, I praised past PA attempts, and encouraged participants' suggestions toward their behaviour change. Also, during the intervention, I constantly reassessed their goals to ensure participants felt they were able to achieve their goal. In doing this, I encouraged participants to identify specific, realistic, and achievable process-oriented goals (e.g., related to the act of performing the behaviour, such as increasing the number of minutes exercising, over time), rather than extrinsic (outcome)-oriented goals (e.g., weight loss, which was highly unlikely with the amount of PA participants were likely to engage in, and working toward, at least during the intervention period). I also emphasised the importance of small steps, and praised any progress participants had made toward their goal. An example of one participant's (process-oriented) goal setting, included a 1-month goal to increase her daily incidental activity to 10 minutes per day (e.g., walking down the street during lunch break instead of driving, and taking the stairs instead of the escalator), and a 3-month goal to increase her incidental activity to 30 minutes, three times a week. Therefore, during the follow-up calls, I encouraged and praised attempts she made to incorporate more activity into her daily routine (e.g., even an extra 5 minutes of walking), and emphasised that even small amounts, when accumulated throughout, were beneficial to her health.

In Study 2, specific factors that overweight women with T2DM and depression identified as barriers to their PA participation included physical, physiological, and

psychological health imitations, lack of motivation, lack of exercise opportunity, effect of past sedentary behaviour, and environmental factors. In contrast, reported facilitating factors for PA included to improve physical and psychological health, instrumental PA (e.g., active housework, playing with grandkids, transport walking, walking their dog), and the positive role of others (e.g., exercising in the company of others, social support/encouragement, and comparativeness). In the Study 3 initial LPAC, I informed participants of these findings, and we addressed barriers and facilitators that were personally identified by each individual.

Furthermore, in the initial LPAC, participants devised a 7-day lifestyle plan for themselves which identified opportunities where they could increase daily PA levels. To assist with increasing participants' PA self-efficacy during this process, I provided encouragement and guidance where needed, for example, praising the participants' PA ideas, or providing suggestions on ways they could increase their weekly overall PA participation (e.g., parking car further from desired destination, and walking the rest of the way). This was not a fixed exercise plan. Rather, participants were guided towards seeing where they could make small, but significant changes. At the time of the initial LPAC, because all participants engaged in a low level of PA, I also encouraged them to consider increasing their PA levels progressively over the 12 weeks following the initial LPAC. I asked the participants to write their plan, and encouraged them to gradually increase their PA levels in order to enhance their PA self-efficacy. Loughlan and Mutrie (1995) recommended that clients should take away a copy of the goals as an 'aide memoire'. Thus, consistent with these recommendations, participants received a manual to take away from the initial LPAC, which included the strategies that were discussed and completed in their initial LPAC (see Appendix Q). For the participant, whose initial

LPAC was conducted over the telephone, I emailed the manual prior to our consultation.

As previously mentioned, the LPAC intervention also included two LPAC support phone calls in the three months after the initial LPAC, at Week 8 and Week 12. The purpose of these calls was to continue to build participants' PA self-efficacy, and enhance the likelihood that they would maintain their PA participation. During these calls, I reinforced the strategies and content discussed in the initial LPAC, addressed any barriers to PA that participants' had, or were currently experiencing, and provided encouragement and support at an individual level. At the end of all phone calls, participants were reminded about completing and returning the study measures. I developed a LPAC intervention guideline document for the initial consultation and follow-up phone calls (See Appendix R).

The LPAC did not involve prescribing a specific pre-determined PA program to each participant. Rather, it aimed to inform and teach the participants about psychological techniques designed to increase PA participation and adherence. Although similar strategies were discussed in the initial LPAC meeting with all participants (as all participants baseline SOC indicated they were in an earlier SOC, see Table 5.1), the final 'set' of strategies used, the way they were applied to the development of the lifestyle plan and LPAC support phone call discussions were personalised. For example, the strategy of identifying social support sources was more valuable for some participants (e.g., those who were preparing to increase their PA) more so than others (e.g., women who were still contemplating increasing their PA, or who had established support networks). On the other hand, women in the contemplation SOC valued the decision balance strategy more than women in the preparation SOC, who had already made the decision to increase their PA level. See

Figure 5.1 for a flow diagram of the Study time line (LPAC intervention, semi-structured interviews, and self-report measures).

Motivational interviewing (MI). During the LPAC intervention, I used the language of MI, consistent with the key components and principles put forth by Miller and Rollnick (2002). Briefly, MI is a way of *being* with people, rather than a set of techniques for *doing* counselling. It is defined as a non-directive, client-centered counselling style for eliciting behaviour change, by helping participants to explore and resolve ambivalence to the behaviour change in question (Miller & Rollnick, 2002), in this case, PA. There are three key components of MI, which are often referred to as being the *spirit* of MI. These include: collaboration (i.e., communication between interviewer and participant is a partnership, and is conducive, rather than coercive, to change); evocation (i.e., the resources and motivation for change are assumed to reside within the participant, and the interviewer enhances intrinsic motivation by drawing on participants' own perceptions, goals, and values); and autonomy (i.e., the responsibility for change is left with the participant, that is, the change arises from within, rather than being externally imposed). Furthermore, there are four general principles which underlie MI: express empathy (e.g., reflective listening), develop discrepancy (e.g., between participants' current and desired behaviour), roll with resistance, and support self-efficacy (Miller & Rollnick, 2002). For example, when discussing the benefits of PA, instead of verbalising to the participant a pre-determined list of benefits, I asked "what do you think are the benefits of PA for you?" Another example of MI was when the participant was discussing their barriers to PA. Instead of telling the participant possible ways they could overcome their barriers (and thus making them a passive participant), I asked questions including "how do you think you could overcome this barrier?" and "what are some other ways you could be active?" Such questions ensured the

participants played an active role in increasing their PA behaviour, and enhanced their confidence in their ability to work out ways of increasing their PA participation.

Clarification of study terms. At this point, to avoid any unnecessary confusion, it is necessary to clarify the main terms in this chapter to describe elements of the study. The term *baseline* refers to the period of time (approximately one week) before the LPAC intervention commenced and is applied to the measurements taken at that time. Thus, the self-report measures (HADS, SPAQ, and PA log) and interview completed during this time period are referred to as the baseline self-report measures and baseline interview. The encompassing term *LPAC intervention* refers to all components of the 12-week intervention: initial LPAC and two LPAC support phone calls. The self-report measures completed during the 12 week intervention are simply referred to as the "self-report measures completed during the intervention period", or are identified by the week they were completed (i.e., Week 3, 6, 8, or 12). The encompassing term *follow-up period* refers to the period of time after the cessation of the LPAC intervention (i.e., 12-week period, from Week 13 to 24 inclusive). Thus, interviews completed during this time period are referred to as Week 16 interview and Week 24 interview. Additionally, the self-report measures completed during this time period are referred to as the follow-up self-report measures, or identified by the week there were completed (i.e., Week 15, 16, 19, 22, or 23). Specifically, in addition to the baseline self-report measures, participants were asked to complete and return (in the reply-paid envelope) the HADS and SPAQ in Week 8, 12, 16, and 22 (i.e., after the initial LPAC); and the PA log in Week 3, 6, 9, 15, 19, and 23. Participants were asked to complete the two PA self-report measures (SPAQ and PA log) at different times to provide two independent insights into their PA behaviour. Figure 5.1 displays a flow diagram of the study time line and elements.

Procedure

Before commencing the study, ethics approval was obtained from VUHREC. I then contacted participants (who had expressed interest in taking part in further research) by telephone, and invited them to participate in the present study. During this phone call, I explained the details of the study and answered any questions that individuals had. I then explained that I would be sending them an information sheet about the study (see Appendix S), a consent form (See Appendix T), and their baseline self-report measures (HADS, SPAQ, PA log). Then I outlined the procedure for filling in and returning their completed measures to me. Participants were asked to read and (if still willing) sign the consent form before they completed the measures, and to promptly return their signed consent form and completed measures in the included reply-paid envelope addressed to me at the University. A time for their baseline interview was then confirmed (see Qualitative Measures section for interview details).

Approximately one week after the baseline interview, the LPAC intervention commenced. Specifically, each participant took part in an initial LPAC (refer to previous discussion for details). Most initial LPACs lasted approximately 90 minutes (ranging from 60-120 minutes). At the conclusion of their consultation, I confirmed a time that was convenient for participants' first (Week 8) LPAC support phone call, and gave them the measures (HADS, SPAQ, PA log) that were to be completed during the 12-week intervention and 12 week follow-up period. For participants' convenience, the measures to be completed at each time point were separately packaged and labelled, and each pack included a reply-paid envelope addressed to me at the University.

At the conclusion of their first LPAC support phone call, a time for participants' second (Week 12) LPAC support phone call was made. As mentioned, following the conclusion of the LPAC intervention, I conducted the Week 16 and Week 24 semi-

structured interviews in those weeks. As in previous scheduled conversations, at the beginning of all three interviews, I asked participants if they had any questions or queries about filling in or returning their self-report measures (HADS, SPAQ, PA log). At the end of each interview, participants were thanked for their participation, and reminded about completing and returning their self-report measures. I also reassured them that they could contact me (phone or email) if they had any queries or concerns. No participant needed to take up this offer. At the completion of the Week 24 interview, participants were debriefed and thanked for their involvement.

Figure 5.1. Flow Diagram of Study 3 Timeline for LPAC Intervention, Interviews, and Self-Report Measures

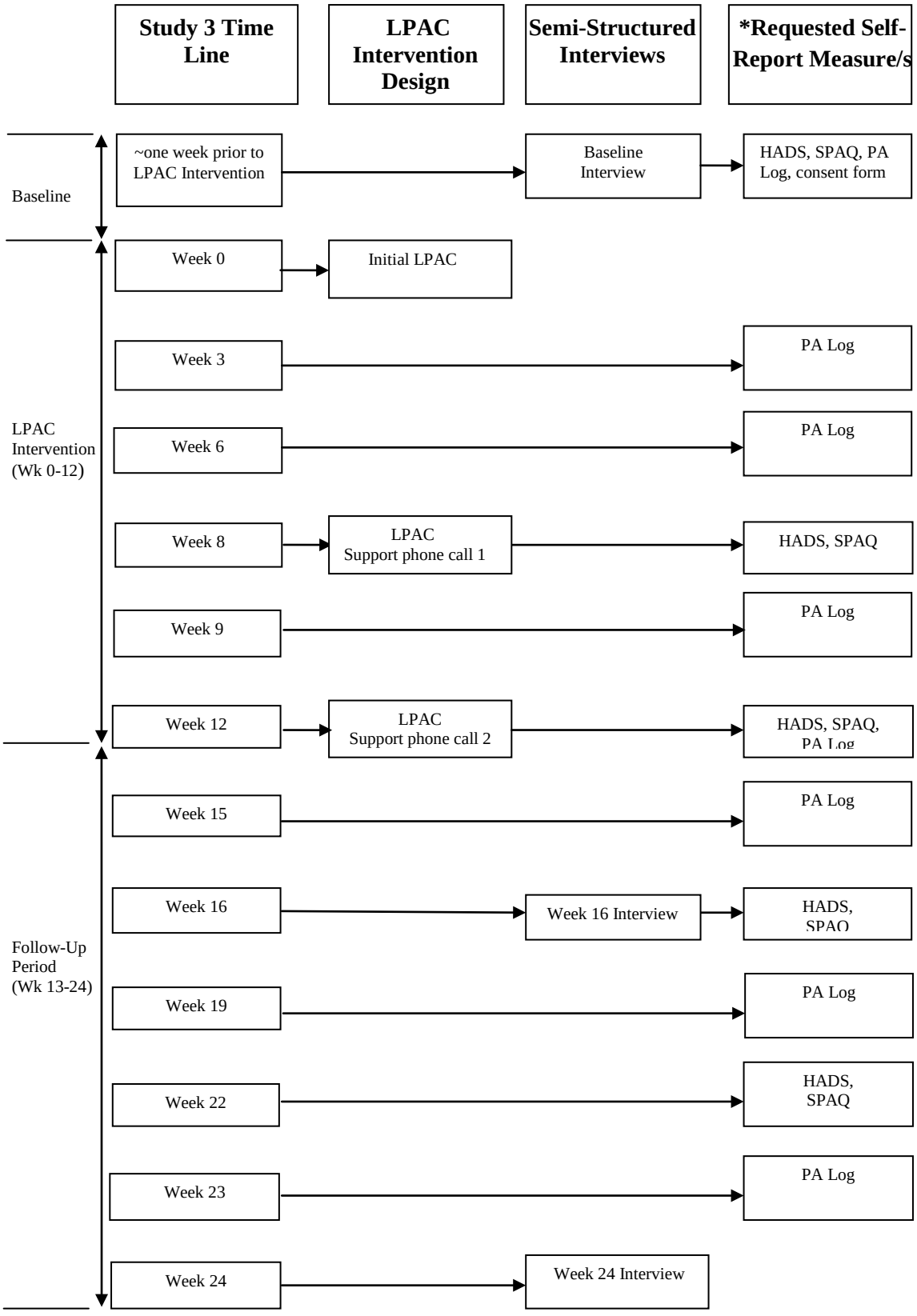

Figure 5.1. *A total of 18 self-report measures were requested to be returned during the study period.

Analysis

Descriptive statistics (frequencies, means, and standard deviations) were used to describe participant characteristics. To explore each participant's experience of participation in the LPAC intervention, particularly on the themes of interest (PA participation and associated mood), interview transcripts obtained from all three semi-structured interviews for all six participants were analysed using thematic analysis (Braun & Clarke, 2006). While thematic analysis offers a summary of the shared experience of participants, it does not provide a sense of the unique experience of each individual (Wilkinson, 2000), and how they responded to the intervention. Thus, in addition to the thematic analysis, I have also included an individual analysis (i.e., case studies) for each of the six participants which include the following: a table of their self-report demographic details (obtained in Study 1); a table outlining the results from their returned self-report measures during the study period; a brief character description (based on my observation and their narrative during the baseline interview and initial LPAC). The purpose of these descriptions is to better capture the participants' experience of participating in the LPAC intervention, and to put into context the influence they perceived the intervention had on their PA behaviour and mood. Thus, participants' descriptions are unique to them, and do not contain the same information); a summary of their PA behaviour during the follow-up period; and a summary of their mood changes during the follow-up period. Note that, unless stated otherwise, supporting quotations regarding participants PA behaviour and mood changes are from their Week 16 and Week 24 interview data. Also, to better capture how each participant responded to the intervention, and to assist in the writing of each participant's individual analysis, I sparingly used other relevant information in conjunction with their qualitative accounts, including their completed HADS and PA measures, and content

from the LPAC intervention (which was tape-recorded, but not transcribed), such as how I delivered the consults (order of content, words used, tone of voice), and how participants responded.

For group level analysis, to summarise participants' shared experiences of the LPAC intervention, I integrated themes (of interest to this study, identified in each participant's transcripts) across participants, to generate a list of master themes. This analysis process continued until the point that all relevant themes were integrated (theoretical saturation). For data analysis purposes, only thematic analysis outcomes from the Week 16 and Week 24 interviews are included in the table of master themes**.** See Appendix W (Table W5.16) and Appendix X (Table X5.17) for the master theme tables (which include the theme, subtheme, and indicative quote references from participants' Week 16 and Week 24 interview data, respectively). Because of the focus of the current study, the two master theme tables in the appendices do not include the non-PA related factors that influenced participants' mood during the study period.

Presented in Table 5.2 and Table 5.3 are summaries of the group level thematic analysis results of interest (themes and sub-themes) that were identified by participants in their Week 16 and Week 24 interviews, respectively. Unlike the master theme tables, these summary tables also incorporate supporting information from participants' self-report measures (i.e., PA log), and, PA and non-PA related factors that influenced their mood during the study period. Moreover, data is presented in a format that allows for individual and shared analysis of themes.

Figure 5.2. Example of the Way Group Level Thematic Analysis Results are Presented in Table 5.2 and Table 5.3

GENERAL DIMENSION	Pseudonym (Clare)	Pseudonym (Paula)	Pseudonym (Lucy)	Pseudonym (Dianne)	Pseudonym (Kelly)	Pseudonym (Mary)
Master theme						
Constituent theme	Yes	-	Yes	Yes	-	Yes

Presented in Table 5.2 are the individual and shared themes relating to participants' PA, mood, and impact of the LPAC intervention on participants' PA behaviour at Week 16 (i.e., 4 weeks after the intervention had ended). Themes are presented in accordance with the example Table set up in Figure 5.2.

Table 5.2

Participants' Physical Activity (PA), Mood, and Impact of LPAC Intervention on Participants' PA Behaviour at Week 16

	Clare	Paula	Lucy	Dianne	Kelly	Mary
CURRENT PA BEHAVIOUR						
Overall change in PA at Week 16						
Little/no short-term change	-	Yes	-	-	-	Yes
Initial increase, but not sustained	-	-	Yes	Yes	-	-
Increased and sustained at week 16 post initial-LPAC	Yes	-	-	-	Yes	-
Current PA amount						
Sedentary/insufficient	-	Yes	Yes	Yes	-	-
Increased PA, and continuing to increase PA amount	Yes	-	-	-	Yes	Yes
PA BARRIERS						
Physical PA barriers						
Health problems (including weight and associated pain)	Yes	Yes	Yes	Yes	Yes	Yes
Psychological PA barriers						

Low mood/depressive symptoms (e.g., self-defeating thoughts, low exercise self-efficacy and low motivation)	-	Yes	Yes	Yes	-	-
Tiredness	Yes	Yes	Yes	Yes	-	Yes
Lack of time/lack of PA priority	-	Yes	-	Yes	-	Yes
External PA barriers						
Uncomfortable bike seat	-	-	Yes	-	-	-
Gym (limited opening hours; times don't suit; gym too busy)	-	-	-	-	-	Yes
Weather (hot)	-	Yes	Yes	-	Yes	Yes
Other (work/family) commitments	-	-	-	Yes	-	Yes
PA FACILITATORS						
Extrinsic						
Experienced physical health benefits of PA (weight loss, energy, sleep, fitness)	Yes	-	-	Yes	-	Yes
Experienced psychological benefits of PA (e.g., enhanced mood, motivation, confidence, feel better)	Yes	-	Yes	Yes	Yes	Yes
Increased PA/ life direction	-	-	-	-	Yes	-
Anticipated health improvement (weight loss, pain reduction)	Yes	Yes	Yes	Yes	-	Yes
Upcoming holiday	Yes	-	Yes	-	-	-
Other people (grandkids, husband, socialising, meeting new people)	-	-	Yes	Yes	Yes	-
Weather (cool)	-	-	-	-	-	Yes
Intrinsic						
Enjoyment of PA participation	Yes	Yes	Yes	Yes	Yes	Yes
RECIPROCAL/INVERSE RELATIONSHIP BETWEEN PA AND MOOD						
Experienced reciprocal/inverse relationship between PA and mood	Yes	-	Yes	Yes	Yes	Yes

IMPACT OF LPAC ON HEALTH BEHAVIOUR						
Overall impact of LPAC intervention on health behaviour at Week 16 post initial-LPAC						
Increased conscious awareness of health behaviours (e.g., diet, PA, blood glucose monitoring)	Yes	Yes	-	-	-	-
Little/no influence on PA participation	-	Yes	Yes	-	-	Yes
Positive impact on PA behaviour: initial increase, but not sustained at week 16	-	-	-	Yes	-	-
Positive impact on PA behaviour: increased and more regular at week 16	Yes	-	-	-	Yes	-
Reported LPAC intervention strategies/elements that had a positive impact on PA awareness behaviour						
PA education (PA recommendations, types and, health benefits)	Yes	-	-	Yes	-	-
Decisional Balance Strategy	-	-	-	-	Yes	-
Follow-up calls	-	-	-	Yes	Yes	-
Verbal support and encouragement	Yes	-	Yes	-	-	-
Periodically completing self-report measures	-	Yes	Yes	Yes	Yes	-
CURRENT MOOD						
Overall change in mood since LPAC intervention						
Negative mood change	-	-	Yes	-	-	-
Initial mood improvement, but deteriorated at week 10 post-initial LPAC	-	-	-	Yes	-	-
Improved mood (increased motivation, confidence, feel better)	Yes	Yes	-	-	Yes	Yes
Current Mood						
Depressed/low	-	Yes	Yes	Yes	-	-
Good/improving	Yes	-	-	-	Yes	Yes
NEGATIVE IMPACT ON						

PSYCHOLOGICAL WELLBEING/MOOD						
Physical Health						
Health problems (incl. weight and associated pain, cancer and chemo treatment)	Yes	Yes	Yes	-	Yes	Yes
Psychological Health						
Comparing current health problems and low PA with past health and PA abilities	-	-	Yes	-	-	-
Comparing recommended PA level with own (insufficient) PA level	-	-	-	Yes	-	-
Low mood/depressive symptoms (inc. self-defeating thoughts, low self-efficacy and motivation, poor self-image/self-confidence)	-	Yes	Yes	Yes	-	Yes
Not knowing answers to health problems/searching for answers	-	Yes	-	-	-	-
Behavioural						
Low PA participation	-	-	Yes	Yes	-	-
Unsuccessful weight loss attempts	-	-	-	-	-	Yes
Lifestyle related/external						
Other people (receiving /anticipating negative judgements/criticisms)	-	-	-	-	Yes	Yes
Centre link/ employment agency	-	-	-	-	Yes	-
Work stressors	-	-	-	Yes	-	-
Food (and associating it with weight gain)	-	-	-	-	-	Yes
POSTIVE IMPACT ON PSYCHOLOGICAL WELLBEING/MOOD						
Physical Health						
PA related: experienced physical health benefits (weight loss, energy, sleep)	Yes	-	-	Yes	-	Yes
Improved health status	Yes	Yes	-	-	Yes	Yes
Psychological Health						
Experienced psychological benefits of PA (e.g., enhanced mood, motivation, confidence, feel better)	Yes	-	Yes	Yes	Yes	Yes

Increased PA and life focus, direction, and motivation	-	-	-	-	Yes	-
High exercise self-efficacy	-	-	-	-	Yes	-
External/Lifestyle related						
Improved life/living circumstances	Yes	Yes	-	Yes	Yes	-
Upcoming holiday	Yes	-	Yes	-	-	-
Other people (Grandchildren, psychologist, social interactions)	Yes	Yes	Yes	-	Yes	Yes
Improved health habits (e.g. diet)	Yes	-	-	-	-	-
Shopping	-	-	-	-	-	Yes
Optimistic Attitude						
Acknowledgement of increased PA behaviour and fitness improvement	Yes	-	-	-	Yes	-
Acknowledgement of psychological wellbeing improvement	-	Yes	-	-	Yes	-
Motivated for further PA participation and associated health/social benefits	Yes	Yes	Yes	Yes	Yes	Yes
Resilience attitude towards other' peoples (actual and perceived) criticisms	-	-	-	-	-	Yes

Note. Yes = participant indicated the respective theme in Week 16 interview and/or self-report measures since initial LPAC); - = participant did not indicate the respective theme in Week 16 interview or self-report measures; Pseudonymous names used in Table correspond with the respective name used in thesis; unique and shared themes are included in Table to better capture individual experiences.

Presented in Table 5.2 are the individual and shared themes relating to participants' PA, mood, and impact of the LPAC intervention on participants' PA behaviour at Week 24 (i.e., 12 weeks after the intervention had ended).

Table 5.3

Participants' Physical Activity (*PA), Mood, and Impact of LPAC Intervention on Participants' PA Behaviour at Week 24*

	Clare	Paula	Lucy	Dianne	Kelly	Mary
CURRENT PA BEHAVIOUR						
Overall changes in PA since Week 16						
Decreased	Yes	-	-	-	-	-
Little/no change	-	Yes	-	Yes	-	Yes
Increased	-	Yes	Yes	-	Yes	-
Current PA Amount						
Minimal (i.e., instrumental/lifestyle PA)	-	Yes	-	Yes	-	-
Insufficient/Low	Yes	-	-	-	-	-
Active, and continuing to increase PA amount	-	-	Yes	-	Yes	Yes
PA BARRIERS (between Week 16 and Week 24 follow-up period)						
Physical PA Barriers						
Health problems incl. associated pain)	Yes	-	Yes	-	Yes	-
Psychological PA Barriers						
Anxiety	-	-	-	Yes	-	-
Low mood/ depressive symptoms (incl. self-defeating thoughts, low self-efficacy and motivation, tiredness)	-	Yes	-	Yes	-	-
External PA barriers						
Weather (rain)	-	-	-	-	-	Yes
Other (work/life) commitments	-	Yes	-	-	-	Yes
PA FACILITATORS (between Week 16 and Week 24 follow-up period)						
Extrinsic						
Experienced physical health benefits of PA (weight loss, expending energy,	-	-	Yes	-	Yes	Yes

sleep, fitness, reduced pain)						
Experienced psychological benefits of PA (e.g., enhanced mood, motivation, confidence, feel better, less stress)	-	-	Yes	-	Yes	Yes
External Apparatus (walking frame)	-	-	Yes	-	-	-
Anticipated health improvement from PA (weight loss, pain reduction)	-	-	-	-	-	Yes
Other people (grandkids, husband, socialising with old and/or new friends, group exercise instructor)	-	-	Yes	Yes	-	-
Role models	-	-	Yes	-	-	-
Weather (too cold)	-	-	-	-	-	Yes
Intrinsic						
Enjoyment of PA	-	-	Yes	-	Yes	-
Positive Past experiences in PA						
Active childhood	-	-	-	-	Yes	-
Optimistic Attitude						
Desire to (continue to) increase PA	-	-	Yes	-	Yes	Yes
Exercise self-efficacy/mastery experiences	-	-	Yes	-	Yes	-
Internal locus of health control	Yes	-	-	-	Yes	Yes
RECIPROCAL/INVERSE RELATIONSHIP BETWEEN PA AND MOOD						
Reciprocal/inverse relationship between PA and mood						
Experienced Reciprocal relationship between increased PA and enhanced mood	-	Yes	Yes	-	Yes	Yes
Experienced reciprocal relationship between reduced PA and reduced mood	-	Yes	-	Yes	Yes	-
	Yes	-	-	-	-	-

No reciprocal relationship experienced (in last 2 months)						
IMPACT OF LPAC ON HEALTH BEHAVIOUR						
Overall impact of LPAC on health behaviour at Week 24						
Increased conscious awareness of health behaviours (e.g., diet, PA, blood glucose monitoring)	-	Yes	-	Yes	-	-
Little/no influence on PA participation at Week 24	-	Yes	-	Yes	-	-
Positive impact on PA behaviour: increased and more regular at Week 24	Yes	-	Yes	-	Yes	Yes
Reported LPAC intervention strategies/elements that had a positive impact on PA behaviour						
Goal setting	-	-	Yes	-	-	-
Follow-up calls	-	Yes	-	Yes	Yes	-
Verbal support and encouragement (from researcher)	Yes	-	-	-	Yes	-
Periodically completing self-report measures	Yes	Yes	Yes	Yes	Yes	-
LPAC intervention strategies/elements that had a negative impact on PA behaviour and mood						
Periodically completing self-report measures	-	-	-	Yes	-	-
SUGGESTIONS FOR LPAC INTERVENTION IMPROVEMENT						
LPAC intervention content/delivery						
More frequent filling in of PA and mood measures (e.g., weekly)	-	Yes	-	-	-	-
Less frequent filling in of PA and mood measures (e.g., fortnightly)	-	-	-	-	Yes	-
Online option of completing measures	-	-	-	Yes	-	-

Longer intervention period with more frequent phone contact (e.g., 24-week instead of 12-week intervention period)	-	-	-	Yes	-	-
No suggestions	Yes	-	Yes	-	-	Yes
CURRENT MOOD						
Overall change in self-reported mood at Week 24						
Negative mood change	-	Yes	-	Yes	-	-
Improved mood	Yes	-	Yes	Yes	Yes	Yes
Current Mood						
Depressed/low (but optimistic of mood improvement)	-	Yes	-	Yes	-	-
Good and improving	Yes	-	Yes	-	Yes	Yes
NEGATIVE IMPACT ON PSYCHOLOGICAL WELLBEING/MOOD (between Week 16 and Week 24 follow-up period))						
Physical Health						
Health problems (incl. weight and associated pain, cancer and chemo treatment)	Yes	Yes	Yes	Yes	Yes	Yes
Psychological Health						
low mood/depressive symptoms (inc. self-defeating thoughts, decreased self-efficacy, low motivation, poor self-image/self-confidence)	-	Yes	-	Yes	-	Yes
Behavioural						
Low PA participation	-	-	Yes	-	-	-
Desire for weight loss	-	-	-	-	-	Yes
Lifestyle related/external						
Other people (receiving and anticipating negative judgements/criticisms)	-	-	-	-	-	Yes
Other people (health of significant others)	-	Yes	-	-	-	-
Other people (chasing doctors reports)	-	Yes	-	-	-	-
Not being able to see	-	-	-	-	Yes	-

daughter/grandchildren as much as she would like						
Still in holding pattern with life direction	-	-	-	-	Yes	-
Life issues	-	-	-	Yes	-	-
POSTIVE IMPACT ON PSYCHOLOGICAL WELLBEING/MOOD (between Week 16 and Week 24 follow-up period)						
Physical Health						
Increased PA participation	-	-	Yes	-	Yes	Yes
PA related health improvement (e.g., weight loss, increased energy, pain reduction)	-	-	Yes	-	-	Yes
Improved health status (lifestyle related)	-	Yes	-	-	-	-
Psychological Health						
Optimistic attitude (e.g., acknowledges health improvement, and/or future health improvement)	Yes	Yes	Yes	-	Yes	-
Optimistic attitude (e.g., acknowledges PA increases in previous 6 months	Yes	Yes	Yes	-	-	-
Resilient attitude (take life as it comes)	-	-	-	-	-	Yes
Increased motivation and focus (with PA and life in general)						
Mindfulness exercises	-	-	-	Yes	-	-
External/Lifestyle related						
Improved life/living circumstances (e.g., more stabilised, clean house)	Yes	-	-	Yes	Yes	Yes
Other people (e.g., grandchildren, family, psychologist, social interactions-work/life)	Yes	Yes	Yes	Yes	-	Yes
Improved health habits (e.g., diet)	-	Yes	-	-	-	-
Anticipated knee	-	Yes	-	-	-	-

operation						
Upcoming holiday	Yes	-	Yes	-	-	-
Weather (not as hot)	-	-	-	-	-	Yes
Hobbies (cooking, gardening)	-	-	Yes	-	Yes	-

Note. Yes = participant indicated the respective theme in Week 24 interview and/or self-report measures (i.e., PA log) since Week 16 interview; - = participant did not indicate the respective theme in Week 24 interview or self-report measures; Pseudonymous names used in Table correspond with the respective name used in thesis; unique and shared themes are included in Table to better capture individual experiences.

Individual Level Results: Case Studies

Before I present and discuss outcomes from this study, several points should be clarified. To preserve participants' anonymity, pseudonyms have been used instead of their real names. It is beyond the scope of this study to elaborate on participants' reported PA barriers and facilitators, and those factors that had a negative or positive impact on their mood during the 24-week Study period. These factors are presented in Table 5.2 and Table 5.3. Nevertheless, in this section, I highlight particular factors relevant to each individual.

Kelly's Physical Activity Behaviour and Mood during the LPAC Intervention and Follow-Up Period

Presented in Table 5.4 is a summary of Kelly's self-report demographic and health status information

Table 5.4

Kelly's Self-Report Baseline Demographic and Health Status [1]

Demographic/health characteristic	
Age (years)	62
BMI[(weight (kg) / height (m)) squared][2]	28
BMI category[3]	Overweight
Birth country	Australia
Occupation	Unemployed
Duration of diabetes diagnosis (years)[4]	10-19
Other chronic illnesses	High blood pressure

Note. [1] Participant's self-report data obtained from their Study 1 demographic information form; [2]BMI based on participants' self-reported weight and height; [3]BMI category: normal weight (BMI 20-24.99); overweight (BMI 25-29.99); obese class I (BMI 30-34.99); obese class II (BMI 35-39.99); obese class III (BMI ≥ 40) (World Health Organisation, 2006); [4]Duration of diabetes diagnosis: based on pre-defined categories used in demographic form: 0-4 years; 5-9 years; 10-19 years; 20 years or more.

Presented in Table 5.5 is Kelly's self-report depression level, PA participation (total weekly PA minutes), and exercise SOC during the study period.

Table 5.5

Kelly's Self-Report Depression Level, PA Participation, and Exercise Stage of Change

Measure	Measure / Timeline: outcome	Baseline	Week 8 (LPAC intervention)	Week 12 (LPAC intervention)	Week 16 (follow-up)	Week 22 (follow-up)
HADS-D[1]	Depression Level	9	9	7	7	6
SPAQ[2]	Total PA min per week	815	1085	840	815	521
SPAQ	Exercise SOC[3]	Prep	Act	Act	Act	Act

Note.[1]HADS-D (Hospital Anxiety and Depression Scale-Depression subscale) score: Depression level categories: No (score 0-7), Mild (8-10), Moderate (11-14), Severe (15-21); [2]SPAQ (Scottish Physical Activity Questionnaire); exercise SOC categories: Precontemplation (Precont), Contemplation (Cont), Preparation (Prep), Action (Act), Maintenance (Main); NA: Not Available (participant did not complete and/or return the requested HADS and/or SPAQ measure for that corresponding week).

Kelly's Presenting Character Description

When I initially contacted Kelly to explore her interest in taking part in the LPAC intervention, she was interested, yet somewhat hesitant. She had a lot of "stuff" going on in her life, however, agreed to participate, because she did want to increase her

PA behaviour. In the baseline interview, Kelly talked about the several serious life events she had experienced in the preceding 5 years that prevented her from maintaining (her previously regular) PA participation. Thus, the combined effect of life events and her inactivity resulted in increased depression, and a lack of motivation and participation in all aspects of her life, including activities she enjoyed, particularly volunteering at her local community centre and gardening. Additionally, she reported torn leg ligaments which caused her pain, restricted her movement, and further reduced her motivation, particularly for PA. Nevertheless, Kelly said that the intervention had come at the right time in her life, and she was hoping it would help her to gain the focus and motivation that she needed, and wanted, to regain her once active lifestyle. Kelly was unable to attend the initial LPAC face to face, however, she was still keen to participate, and I conducted the consultation over the phone.

Kelly's Physical Activity Behaviour

Physical activity participation at Week 16. During the month since the LPAC intervention had finished, Kelly's torn ligaments in her right leg and associated pain, continued to prevent her from increasing her PA behaviour to a level with which she was content:

> I'm not happy yet with what I am still doing. That will work out in the next 6 months I think. With the leg getting better and that…I am just waiting for it to settle down a little bit more so I can go back to swimming a bit and do that.

Kelly's reported PA behaviour (45-60 min walk every second day), however, suggested that she was still engaging in a sufficient amount of PA for health benefits. It was likely that her past PA experiences were a benchmark for the PA she knew she was capable of, and wanted to achieve, and also influenced her high PA self-efficacy in her ability to be active. For example, her PA self-efficacy was displayed in her cheerful

acknowledgement that despite her restrictions, she had still increased her walking, and expressed keenness to continue this progression as her leg improved: “I am gradually getting there. And I am not so bad when I take the dog out [walking].”

Physical activity participation from Weeks 16 to 24. During the follow-up period from Week 16 to 24, Kelly followed through with the PA intentions she described in the Week 16 interview, and her PA level continued to improve. At the time of the Week 24 interview, she was engaging in more lifestyle PA (housework and gardening), and was walking almost every day (45-60 min duration). Kelly also seemed to be engaging in other lifestyle activities that she enjoyed, particularly gardening. This suggested that her motivation for life, in general, had increased: “Well I am still inhibited by this rotten left leg and it is slowly getting better and I’ve probably done a bit more especially around the garden and around the house.”

Another comment on this topic was:

> I’ve done a few longer walks and I’ve been able to do that even though my leg still gets sore after it. ... So I change it around and I have been able to get him [Kelly’s dog] on the longer walks…. Oh well I think I am only missing out on one day now. That depends on how bad my leg gets.

The PA barriers and facilitators that Kelly mentioned in the Week 24 interview were similar to those she described in previous scheduled conversations. Specifically, physical health problems (torn leg ligaments) continued to restrict her behaviour, however, her enjoyment of participating in PA, and the associated physical and psychological health benefits continued to be her main reasons for progressing with her PA participation. She also credited the LPAC intervention for assisting with her PA behaviour: “It’s [LPAC intervention] made me focus on things you know and what I should be doing or what I want to do.”

Kelly often talked about future PA participation that she intended to engage in once her leg improved. During these conversations, her choice of words and voice tone indicated that she was confident that she would be able to engage in her desired PA behaviour beyond the study cessation:

> I plan to actually hire a [squash] court for half an hour myself and just go up and down the walls which you can't do if you have a partner and I was going to do that for about 20 minutes.… if I've done that for a couple of times and I can see where my leg is going and go from there;

Further Kelly commented:

> very shortly when my leg gets a bit better I'm going to go into some of the exercise classes up at the community centre.…I've been tempted the last weeks. I've been bopping around to the music but I didn't go into the class because I am on the desk.

Kelly's Mood

Mood at Week 16. As previously alluded to, in the baseline interview, Kelly talked about her current elevated depression level (reflected in her baseline HADS-D score of 9, indicative if mild depression; see Table 5.5), which she had experienced for the last 5 years. In light of her life circumstances prior to taking part in the LPAC intervention, a positive outcome evident in the Week 16 interview was Kelly's improved mood, paralleling her enhanced PA participation, and in an uplifted tone, she said "I think it [her mood] will get even better."

Factors that Kelly described as positively impacting her mood during this time included: participating in the LPAC intervention; increased PA and life focus, motivation, and participation; improved life circumstances (including recommencing her volunteering at a community centre and the associated social contact); physical

health improvement; and enhanced well-being. The extent to which these factors contributed to Kelly's mood improvement cannot be quantified, however, it seemed that participating in the intervention had a positive direct and indirect (e.g., via increased PA) impact on her mood. Supporting Kelly's qualitative accounts of mood improvement was her self-reported depression level at Week 12 and 16 (HADS-D score of 7) which reflected no depression.

Mood from Week 16 to 24. Encouragingly, during the Week 16 to 24 follow-up period, Kelly's mood continued to improve: "things have changed a lot...it's been very positive and it's been good." In the Week 24 interview, Kelly commented that her overall mood was "much better than it has been", and described herself as being more friendly, chirpy, and outgoing at the community centre:

> I think I am a bit more friendly and outgoing to them...Generally, I have noticed probably in the last two months or one month whatever it might be, I walk in and be chirpy and say something silly and they will laugh; that sort of thing.

Furthermore, Kelly's mood improvement was reflected in her self-reported "no depression" at Week 22 (indicated by a HADS-D score of 6).

In summary, although Kelly was initially hesitant about taking part in the LPAC intervention, her narratives and self-report responses suggest that she had benefited greatly (physically and psychologically) from participating in the intervention. Despite her physical health restrictions, Kelly continued to progress with her PA participation during the follow-up period, and experienced a reciprocal relationship between increased PA and improved mood. Importantly, she was planning to continue her PA participation beyond the follow-up period.

Lucy's Physical Activity Behaviour and Mood during the LPAC Intervention and Follow-Up Period

Presented in Table 5.6 is a summary of Lucy's self-report demographic and health status information.

Table 5.6

Lucy's Self-Report Baseline Demographic and Health Status [1]

Demographic/health characteristic	
Age (years)	62
BMI[(weight (kg) / height (m)) squared][2]	54
BMI category[3]	Obese class III
Birth country	Australia
Occupation	Retired
Duration of diabetes diagnosis (years)[4]	20 years or more
Other chronic illnesses	Depression, arthritis, sleep apnoea, high blood pressure

Note. [1] Participant's self-report data obtained from their Study 1 demographic information form; [2]BMI based on participants' self-reported weight and height; [3]BMI category: normal weight (BMI 20-24.99); overweight (BMI 25-29.99); obese class I (BMI 30-34.99); obese class II (BMI 35-39.99); obese class III (BMI $\geq$ 40) (World Health Organisation, 2006); [4]Duration of diabetes diagnosis: based on pre-defined categories used in demographic form: 0-4 years; 5-9 years; 10-19 years; 20 years or more.

Presented in Table 5.7 is Lucy's self-report depression level, PA participation (total weekly PA minutes), and exercise SOC during the study period.

Table 5.7

Lucy's Self-Report Depression Level, PA Participation, and Exercise Stage of Change

Measure	Measure outcome / Timeline	Baseline	Week 8 (LPAC intervention)	Week 12 (LPAC intervention)	Week 16 (follow-up)	Week 22 (follow-up)
HADS-D[1]	Depression Level	12	NA	12	NS	9
SPAQ[2]	Total PA min per week	570	NA	530	NA	230
SPAQ	Exercise SOC[3]	Cont	NA	Prep	NA	Prep

Note.[1]HADS-D (Hospital Anxiety and Depression Scale-Depression subscale) score: Depression level categories: No (score 0-7), Mild (8-10), Moderate (11-14), Severe (15-21); [2]SPAQ (Scottish Physical Activity Questionnaire); exercise SOC categories: Precontemplation (Precont), Contemplation (Cont), Preparation (Prep), Action (Act), Maintenance (Main); NA: Not Available (participant did not complete and/or return the requested HADS and/or SPAQ measure for that corresponding week).

Lucy's Presenting Character Description

When I contacted Lucy to explore her interest in taking part in the LPAC intervention, she was very enthusiastic. In the baseline interview, Lucy acknowledged in a frustrated manner that she had engaged in very little PA for at least 8 months. Functional limitations (FL; particularly related to her arthritis and weight status), and depression were her main reoccurring PA barriers: "And but my legs are weak because I haven't been using them… oh look I can't even go shopping and I'm not only puffing, but I'm actually absolutely exhausted. And that's not like me." She described low confidence and minimal optimism regarding her ability to improve her health status. Nevertheless, increasing her PA behaviour was something that she wanted to do. Lucy's FL were evident in the initial LPAC. For example, she had physical difficulty walking to the consultation venue (e.g., pain and slowed walking pace), and was unable to climb stairs. During the initial LPAC, she frequently expressed and portrayed discomfort and frustration related to arthritic pain in her lower back and excess body weight. Thus, Lucy was encouraged to slowly build up her activity level during the follow-up period (e.g., building up to three, 5 minute bouts of walking or stationary bike). Furthermore, it seemed that psychological improvements (e.g., in her motivation to be active) were going to be the main indicator of her progress during the follow-up period.

Lucy's Physical Activity Behaviour

Physical activity participation at Week 16. In the Week 16 interview, Lucy reported that during the LPAC intervention period, she had increased her PA (i.e., walking). Unfortunately, however, FL (particularly arthritic pain) prevented her from continuing her small increments in walking beyond the intervention period:

> Like I can't stand and do things I have to sit and do things. Like we went away and I had to sit down and prepare the meals and all that. But I always sit down

and prepare meals anyway because I can't stand. But the pain just isn't stopping when I stand up and that.

Lucy expressed frustration at her lack of PA, and her choice of words, voice tone, and expressions suggested that elevated depression played the main role in her lack of PA participation following the intervention cessation (i.e., between Week 13 to 16). For example, she said "I just feel as though I am damned lazy", and her lack of motivation (for all daily activities, not just PA) was likely a symptom of depression: "I've got no motivation to do anything. I really have no motivation. I wouldn't care if I never went outside the door." Lucy seemed to be experiencing a negative reciprocal relationship between her low PA and mood. On a positive note, she indicated that she wanted to begin water aerobics in the coming weeks. She enjoyed water aerobics, and was hoping that it would help to alleviate her arthritic pain.

Physical activity participation from Weeks 16 to 24. An encouraging outcome was that since the Week 16 interview; Lucy had acted upon her intentions. In this time, she had begun water aerobics (once a week for 60 min) and was also walking in the water (up and down the pool lane, once a week for 60 min). It was evident in Lucy's speech and uplifted voice tone that her participation in water aerobics had also improved her functional ability in land-based activities: "I seem to be walking a bit better….[and] been getting around a bit more."

Lucy talked about several facilitating factors that had influenced her water-based PA participation. These included that she experienced physical health benefits: "I don't seem to have any [arthritic] pain in the water"; physiological health benefits: "I feel more energetic"; and psychological health (and thus mood) benefits, including a sense of achievement: "It [water aerobics] makes me feel like I am conquering to do it. I finally achieved something"; and enjoyment: "I want to do it [water aerobics] so that's

what motivates me. And I like the water…yeah I do enjoy it." Additionally, social factors associated with water aerobics contributed to Lucy's improved mood, and facilitated her water aerobics participation. In particular, the opportunity to meet new people: "getting out of the house [and] meeting a lot of people is one of the main things. Feeling better in that way"; the water aerobics instructor: "And the lady [instructor] you know just lets you go at your own pace so that's a good thing"; and, some of her fellow class attendants, who, through their courage, acted as positive role models:

> It really is amazing what they can do in water. There is one lady that had a stroke and she is not that old and you know what she can do in that water for someone who can't walk is amazing… and it is motivating me more. If they can do it I can do it too.

Moreover, in describing her PA participation, Lucy said that participating in the LPAC intervention "really motivated me…Very motivated me". Other non-PA-related factors that facilitated her PA behaviour included improving her fitness for an upcoming boat holiday, her walking frame, and having a "nagging" husband.

During this time, Lucy still experienced chronic PA barriers: tiredness (related to her sleep apnoea), and arthritis and associated pain. Importantly, however, unlike previous experiences of her FL that inhibited her PA, her narrative suggested that she no longer perceived these limitations as being fully restrictive on her physical ability (at least at the time of the Week 24 interview), and was keen to continue progressing with her PA level in ways she was able (e.g., water based PA) beyond the follow-up period. She expressed an increased PA self-efficacy in her ability to be active: "Yep I feel as though I can do it now…Yeah I can do it."; and an optimistic attitude about her PA (and mood) progress: "I am getting there." Considering her low confidence in her ability to be physically active prior to taking part in the LPAC intervention, these comments

demonstrate Lucy's noted progress in her PA behaviour during, and following, the intervention.

Lucy's Mood

Mood at Week 16. In the Week 16 interview, Lucy indicated that during the LPAC intervention she had experienced enhanced mood and well-being associated with her increased PA level. Nevertheless, paralleling her deteriorated PA was her elevated depression level during the follow-up period since the intervention cessation. For example, she said "yeah I get more depressed yeah" and used words like "negative" and "disgusting" to describe her overall mood and low PA level. As previously mentioned, experiencing elevated depression seemed to be a recurring mental health problem for Lucy. Persistent factors that negatively impacted on her well-being included: Physical health problems (e.g., excess weight, arthritis and associated pain); her inability to carry out daily physically active tasks, including playing with her grandchildren; and frustration at her lack of ability to be physically active. Lucy's elevated depression was further suggested in her baseline and Week 16 self-report HADS-D score of 12, which indicated a moderate level of depression (see Table 5.7).

Mood from Week 16 to 24. Fortunately, consistent with her increases in PA behaviour during the Week 16 to 24 follow-up period, Lucy reported improved mood/reduced depression: "I feel a lot more positive"; and "I feel good…I feel better in my mood too." In particular, her frequent choice of positive or upbeat words in the Week 24 interview suggested that she had made notable psychological improvement, especially in her self-confidence, motivation to engage in daily activities, and, as previously mentioned, her PA self-efficacy:

> I feel more, how can I say it? I've got the urge to do it more than I had then… more motivation. That's the word. More motivation… To do things….I would say like I go out in the car more often now

When reflecting on her mood over the last 6 months, particularly in the Week 16 to 24 follow-up period, Lucy said "I do seem to be able to get back to my old self that's all…playing practical jokes and all that. I'm getting there." She described herself as feeling "happier in myself", which was a marked improvement in her self-descriptions from the baseline interview. Lucy credited her participation in water aerobics as being the main factor that had influenced her mood during this time, saying that it was "doing [her] body and mind good." Additionally, she commented: "Well I'm not so depressed…I'm benefiting from doing that [water aerobics]." Moreover, compared to Week 16, Lucy's reduced self-reported depression level at Week 22 (HADS-D score of 9, indicative of mild depression, see Table 5.7) further indicated her improved mood during the Week 16 to 24 follow-up period.

In summary, Lucy's experiences during the LPAC intervention and follow-up period indicated that the intervention contributed to her initial increased motivation and PA participation, at least during the 12-week intervention. During this time, Lucy described associated psychological benefits. Unfortunately, in the follow-up period from Week 13 to 16, PA barriers (namely arthritis and pain, and depression) prevented her from continuing her PA progression, and her reduced/lack of PA contributed to her low mood (e.g., elevated depression). In the follow-up period from Week 16 to 24, Lucy commenced water aerobics. She noted a derived increase in her PA self-efficacy, and other psychological benefits from various aspects of water aerobics participation. These benefits played a main role in her reduced depression during this period, and facilitated further PA participation, suggesting she was experiencing a reciprocal relationship

between her PA and mood. Importantly, Lucy was keen to progress with her PA participation beyond the follow-up period**.**

Mary's Physical Activity Behaviour and Mood during the LPAC Intervention and Follow-Up Period

Presented in Table 5.8 is a summary of Mary's self-report demographic and health status information.

Table 5.8

Mary's Self-Report Baseline Demographic and Health Status [1]

Demographic/health characteristic	
Age (years)	61
BMI[(weight (kg) / height (m)) squared][2]	30
BMI category[3]	Obese class I
Birth country	Poland
Occupation	Home Duties
Duration of diabetes diagnosis (years)[4]	5-9
Other chronic illnesses	Epilepsy, Crohns, Eye problems

Note. [1] Participant's self-report data obtained from their Study 1 demographic information form; [2]BMI based on participants' self-reported weight and height; [3]BMI category: normal weight (BMI 20-24.99); overweight (BMI 25-29.99); obese class I (BMI 30-34.99); obese class II (BMI 35-39.99); obese class III (BMI $\geq$ 40) (World Health Organisation, 2006); [4]Duration of diabetes diagnosis: based on pre-defined categories used in demographic form: 0-4 years; 5-9 years; 10-19 years; 20 years or more.

Presented in Table 5.9 is Mary's self-report depression level, PA participation (total weekly PA minutes), and exercise SOC during the study period.

Table 5.9

Mary's Self-Report Depression Level, PA Participation, and Exercise Stage of Change

Measure	Measure Timeline / outcome	Baseline	Week 8 (LPAC intervention)	Week 12 (LPAC intervention)	Week 16 (follow-up)	Week 22 (follow-up)
HADS-D[1]	Depression Level	4	5	4	NA	7
SPAQ[2]	Total PA min per week	3150	4590	NA	3675	1260
SPAQ	Exercise SOC[3]	Prep	Act	NA	Cont	Main

Note.[1]HADS-D (Hospital Anxiety and Depression Scale-Depression subscale) score: Depression level categories: No (score 0-7), Mild (8-10), Moderate (11-14), Severe (15-21); [2]SPAQ (Scottish Physical Activity Questionnaire); exercise SOC categories: Precontemplation (Precont), Contemplation (Cont), Preparation (Prep), Action (Act), Maintenance (Main); NA: Not Available (participant did not complete and/or return the requested HADS and/or SPAQ measure for that corresponding week).

Mary's Presenting Character Description

On the outset, Mary was keen to participate in the LPAC intervention. In the baseline interview, she said her overall mood was good, and described herself as a regularly active individual, engaging in a sufficient amount of PA for health benefits (e.g., walking, gym once a week, and swimming once a week). This suggested that for Mary, participating in the intervention would be more about assisting her to maintain her regularly active regimen than increasing her weekly PA.

Mary's Physical Activity Behaviour

Physical activity participation at Week 16. In the Week 16 interview, Mary said overall, her (somewhat) regular PA participation was no different to her participation level prior to taking part in the intervention: "No it's always been like that. I have always liked to walk if I could." Mary enjoyed engaging in PA as a means in itself; however, similar to her motives prior to taking part in the LPAC intervention, weight loss (an extrinsic motive) continued to be the main factor facilitating her PA behaviour. Mary often reported other commitments, particularly family oriented activities and doctors appointments that prevented her from engaging in PA: "As long

as my daughter doesn't need me and no one needs me, at least once a week I would like to go [to the gym]." This suggested PA was not a priority for Mary, particularly during times when her scheduled PA session conflicted with other higher priority commitments.

Additionally, although Mary reported herself as being regularly active, and likely did intend to be regularly active, her narratives suggested that her PA level was lower than the level she reported, and not enough for health benefits. For example, her language when describing her PA behaviour was often in the future tense, and she frequently reported missed PA engagements:

> I went past another gym, so I was thinking about going to another gym, but I haven't looked into it. Maybe when the school holidays finish and all the kids are back… I might have a look for another one, if I don't hear anything from them [i.e., a gymnasium employee].

Physical activity participation from Weeks 16 to 24. In the follow-up period from Weeks 16 to 24, Mary's PA behaviour remained relatively unchanged: "I still go to my swimming once a week and the other gym I still go to once a week." Similar to previous weeks, extrinsic factors (e.g., weight loss, cooler weather) were the main reasons she gave for her PA behaviour and appeared to continue to prevent her regular participation in scheduled PA sessions. For example, in the Week 24 interview, although Mary indicated taking part in the LAPC intervention had motivated her to continue her PA participation; she often mentioned PA barriers, particularly having other commitments, which prevented her from acting on her PA intention: "So I said I haven't gone around to walking around the beach yet. Maybe next month. So every time I want to do it something else pops up"; and "I am sort of trying to walk a bit more, but not always."

As alluded to previously, a reoccurring theme evident in the scheduled interviews was Mary's obsession with weight loss. It seemed her desperate desire to lose an unrealistic amount of weight and her inability to achieve this were negatively impacting on her adherence to her reported regular PA regimen. For example, in the baseline interview, Mary said "I need to lose 10 kilos, but it is very hard", yet in the Week 24 interview, she said "I've still got to lose 15 kilos.....I don't think I will lose 15 kilos, but maybe 5 kilos. Fifteen kilos will take me I think about 10 years". Her inconsistent weight loss target suggested that Mary just wanted to lose *a lot* of weight. Additionally, it seemed that her failure to achieve substantial weight loss (her main PA facilitator) contributed to her frequently indicated perception that weight loss was ultimately out of her control, and may have contributed to her lack of PA adherence:

> One year I'm fatter. One year I'm skinnier. I'm like a yoyo. Well I can't help that. My father use to say when the doctor told him he's too fat, so he use to joke with him and say you've got too many bones in the body that's why. He use to make a joke with the GP. My parents were also overweight….they lost, the put on. So I suppose it could be in the genes.

It is important to highlight that Mary's self-reported PA level during the intervention period (displayed in Table 5.9) was notably inflated, and contradicted her narrative accounts. English was not Mary's first language, and her speech was sometimes hard to understand. This may have been due to her misunderstanding of what to report (e.g., she often reported sedentary PA activities like resting and ironing), and she sometimes overestimated what she had done. Therefore, Mary's self-reported PA level and PA SOC need to be interpreted cautiously.

Mary's Mood

Mood at Week 16. In the Week 16 interview, Mary reported that her overall mood during the intervention and follow-up period had been good. This was also reflected in her self-reported "no depression" at baseline (HADS-D score 4), Week 8 (HADS-D score 5), and Week 12 (HADS-D score 4; see Table 5.9). The majority of factors that impacted on Mary's positive mood were not limited to the study period. These included PA-related factors (e.g., enjoyment, and health improvement [particularly weight loss]), and non-PA related factors (e.g., cooler weather, visiting people, and shopping).

Mood from Week 16 to 24. Similarly, in the Week 24 interview, Mary reported that her overall mood since the Week 16 interview had been good (if anything, improved), and her self-reported "no depression" (HADS-D score of 7) at Week 22 further suggested this. Mary noted the same influencing factors that she described in the Week 16 interview. In particular, participating in PA (when she could) played an important role in her psychological well-being: "I try to walk a bit more. I am not so depressed". Furthermore, Mary said that she "occasionally, very seldom" experienced low days. Thus, although her obsession with weight loss seemed to negatively impact on her PA participation, it did not appear to have a significant impact on her mood.

In summary, prior to, and during the intervention and follow-up period, Mary reported being regularly active, and that her overall mood was good. She described a reciprocal relationship between her PA participation and her mood. Specifically, she reported that she experienced psychological benefits (e.g., mood improvement) from PA that contributed to her PA intention and (reported) PA participation. Furthermore, although Mary said the LPAC intervention had increased her motivation to continue participating in PA; her actual PA behaviour appeared to be lower than what she

reported. In particular, it seemed that her failure to achieve an unrealistic, yet desired, amount of weight loss contributed to her frequently missed PA participation.

Clare's Physical Activity Behaviour and Mood during the LPAC Intervention and Follow-Up Period

Presented in Table 5.10 is a summary of Clare's self-report demographic and health status information.

Table 5.10

Clare's Self-Report Baseline Demographic and Health Status [1]

Demographic/health characteristic	
Age (years)	57
BMI[(weight (kg) / height (m)) squared][2]	38
BMI category[3]	Obese class II
Birth country	Australia
Occupation	Home Duties
Duration of diabetes diagnosis (years)[4]	0-4
Other chronic illnesses	Angina, ovarian cancer

Note. [1] Participant's self-report data obtained from their Study 1 demographic information form; [2]BMI based on participants' self-reported weight and height; [3]BMI category: normal weight (BMI 20-24.99); overweight (BMI 25-29.99); obese class I (BMI 30-34.99); obese class II (BMI 35-39.99); obese class III (BMI $\geq$ 40) (World Health Organisation, 2006); [4]Duration of diabetes diagnosis: based on pre-defined categories used in demographic form: 0-4 years; 5-9 years; 10-19 years; 20 years or more.

Presented in Table 5.11 is Clare's self-report depression level, PA participation (total weekly PA minutes), and exercise SOC during the study period.

Table 5.11

Clare's Self-Report Depression Level, PA Participation, and Exercise Stage of Change

Measure	Measure outcome / Timeline	Baseline	Week 8 (LPAC intervention)	Week 12 (LPAC intervention)	Week 16 (follow-up)	Week 22 (follow-up)
HADS-D[1]	Depression Level	5	10	4	4	3
SPAQ[2]	Total PA min per week	160	420	485	440	365
SPAQ	Exercise SOC[3]	Prep	NA	Prep	Act	Prep

Note.[1]HADS-D (Hospital Anxiety and Depression Scale-Depression subscale) score: Depression level categories: No (score 0-7), Mild (8-10), Moderate (11-14), Severe (15-21); [2]SPAQ (Scottish Physical Activity Questionnaire); exercise SOC categories: Precontemplation (Precont), Contemplation (Cont), Preparation (Prep), Action (Act), Maintenance (Main); NA: Not Available (participant did not complete and/or return the requested HADS and/or SPAQ measure for that corresponding week).

Clare's Presenting Character Description

During the recruitment phone call, Clare expressed keenness in taking part in the LPAC intervention. In the baseline interview, she said that for the past 3 years, apart from lifestyle activities (e.g., housework), she had engaged in relatively little PA, mainly because she had ovarian cancer. At the time of this interview, however, she reported being cancer free, and was ready to increase her PA behaviour. This suggested that for Clare, the intervention should be tailored to assist her in acting on her PA intentions. In the initial LPAC, Clare did not report or visibly indicate any major physical health problems that would restrict her ability to be active, and was enthusiastically engaged in all LPAC strategies. Over the coming weeks, she intended to build up to 30 minutes of daily exercise (in addition to her usual daily lifestyle activities), such as walking, swimming, or stationary bike.

Clare's Physical Activity Behaviour

Physical activity participation at 16 Week. Unfortunately, 3 weeks after the initial LPAC Clare discovered that her cancerous tumour had returned. It was evident in speech and self-report responses that the physical and emotional side-effects of her

unfavourable health condition and associated chemo treatment had a significantly negative impact on her daily routines, not just PA. Inevitably, Clare's PA goals and initial PA plan had modified since the initial LPAC. Nevertheless, she still wanted to continue participating in the intervention and follow up, and her motivation and continued progression with her PA, in ways and when she was able, appeared relatively un-wavering. Supporting Clare's narrative accounts was her increased and relatively stable self-reported PA level from baseline (160 minutes of weekly PA) to Week 16 (485 minutes of weekly PA; see Table 5.11). Moreover, in the Week 16 interview, she said "I've done a bit more walking and exercising. More regular I would say"; and "Yeah but over the last two weeks I've felt a lot more active than I have been for a while. So the activity has increased."

Additionally, Clare indicated a desire to continue with her PA participation, particularly for desired health benefits, such as weight loss: "Yes the more activity and losing some weight too. That's been good. I would like to lose a bit more". Furthermore, Clare reported that participating in the LPAC intervention had motivated her to make other healthful behavioural changes, particularly to her dietary habits. For example, she said:

> You think a bit more about your health and wellbeing. It helps you think more about that…. Once upon a time I wouldn't leave very much on my plate. But now I think oh I've had enough of this or I don't feel like that.

Physical activity participation from Weeks 16 to 24. In the time period since Week 16, worsened chemotherapy side effects prevented Clare from sustaining her initial increased PA level, particularly in walking, which she enjoyed. Thus, between Week 16 to 24, her PA behaviour had "come down a little bit lower" compared to

previous weeks, and she was not engaging in a level of PA to achieve physical health benefits.

The severity of Clare's experienced side effects (e.g., nausea, tiredness) impinged on her motivation and participation in all aspects of her daily life:

> Yeah, I mean I've only sort of had more the tiredness most of the time but like I've said the last fortnight after I've had the last two weeks of chemo I started to feel sick and just couldn't be bothered. A few mornings I slept in till about ten, half past ten one day I think I slept into and just sort of potted around all day like you can't be bothered mood. You don't want to start anything because you are too tired to start anything but you know you've got to do things. I mean it was a chore to sort of do the dishes and just to tidy up and you think oh do I have to tidy up or do I have to do this or do I have to do that… Yes. I did have some tablets here that are for the nausea… And my appetite went a little bit too.

Nevertheless, although her walking behaviour had decreased, Clare continued to lead an active lifestyle, at least when she was able. For example, in the Week 24 interview, she said that during this time, she and her husband had shifted to their new residence, and also helped their son move home, which involved an increase in active house chores, such as cleaning, and labour intensive packing/unpacking. This was demonstrated by her self-reported PA level (365 minutes of weekly PA) at Week 22 (see Table 5.11)

It seemed that Clare's optimism about her physical ability, despite her unfavourable health condition, and motivation to continue progressing with her PA, was contributing to her continued PA behaviour progression. For example, when reflecting on her PA behaviour in the preceding 6 months, she acknowledged in an uplifted tone that "I have done the best I can with what's been going on so". Thus, although Clare

was not able to engage in her initially-intended amount or type of PA during the intervention and follow-up, in the context of her health condition, compared to her baseline PA level, her sustained motivation and increased PA (in ways she was able, such as lifestyle PA) during the intervention and follow-up period was notable.

Clare's Mood

Mood at Week 16. In Clare's baseline interview, she said that her mood was "okay at the moment…No major upsets." She expressed her low level of PA as negatively impacting on her physical and psychological health, and acknowledged that increasing her PA "would probably make me feel a bit better in myself. I mean I feel alright but I could feel better." As mentioned, she was keen to increase her PA over the coming weeks. Her unanticipated cancer diagnosis, and associated chemo-therapy treatment had a significantly negative impact on her mood, and likely accounted for the increase in Clare's self-reported depression level (HADS-D score 10, indicating mild depression) at Week 8. A positive outcome however, was that during the intervention and follow-up period (i.e., between Week 13 to 16), Clare noted several factors that led to an overall improvement in her mood, including: engaging in PA; improved health status, several positive lifestyle changes (e.g., selling her house); and an upcoming family holiday. Therefore, in the Week 16 interview, her choice of words, and tone of voice suggested that her overall mood was uplifted, and consistent with her PA level, was continuing to improve. As displayed in Table 5.11, with the exception of Week 8, Clare's self-report depression level at baseline (HADS-D score of 5), Week 12 (score of 4), and Week 16 (score of 4) were indicative of no depression, which further suggest her overall uplifted mood.

Additionally, it seemed that Clare's increased PA self-efficacy and associated fitness improvement had positively impacted on her mood:

> My son had a team down at Werribee and they walked day and night, I didn't do that I only did about 10 laps but that's more than I reckon I would have been able to do….if I hadn't been as active as normal.

Mood from Week 16 to 24. Despite Clare's worsened chemotherapy side effects (and associated decrease in PA behaviour) during the follow-up period between Week 16 to 24, her mood continued to improve: "I still have the down days but they are less and the mood is good overall… I would say [my mood is] about 6 or 7 [out of 10]." Because her PA level had decreased during this time, Clare mentioned that she was not deriving any associated psychological benefits from PA. Nevertheless, her comments indicated that her lack of PA was not negatively impinging on her mood: "I know I haven't done much activity but mood has been up." Instead, Clare talked about external/lifestyle factors that had a positive influence on her mood, including moving residence, her family, an upcoming holiday, seeing a psychiatrist, and antidepressants. Clare's qualitative accounts of her mood improvement during this period were reflected in her self-report "no depression" (HADS-D score of 3) at Week 22.

Moreover, it seemed that Clare's "forward thinking" attitude, and uplifted mood helped her to remain optimistic and undefeated by her cancer, which, as mentioned above, also had a positive impact on her PA motivation, and intention to continue progressing with her PA level as her health status improved:

> I think what he [psychiatrist] was trying to say was that the cancer might get you. If you don't think positive it will get you sort of thing. You've got to be positive and I've been down there where you think oh well why don't I just go or something like that. But that's only short lived. You've got to have something to look forward to. Well we've got our trip next year to look forward to with the kids.

In summary, it was evident in Clare's self-report measures and speech that the LPAC intervention had positively impacted on her PA motivation and behaviour, and other health behaviours (e.g., diet). During the follow-up period, she had experienced a reciprocal relationship between her increased PA and improved mood, particularly during the intervention and first four weeks of the follow-up period. Nevertheless, her reduced PA level during the period between Week 16 to 24 did not negatively impinge on her mood. Rather, during this period, her mood continued to improve due to lifestyle factors. Importantly, evident was Clare's PA self-efficacy and motivation to continue progressing with her PA (as her health status improved) beyond the follow up period.

Dianne's Physical Activity Behaviour and Mood during the LPAC Intervention and Follow-Up Period

Presented in Table 5.12 is a summary of Dianne's self-report demographic and health status information.

Table 5.12

Dianne's Self-Report Baseline Demographic and Health Status [1]

Demographic/health characteristic	
Age (years)	45
BMI[(weight (kg) / height (m)) squared][2]	45
BMI category[3]	Obese class III
Birth country	Australia
Occupation	Community Development worker
Duration of diabetes diagnosis (years)[4]	0-4
Other chronic illnesses	Depression, sleep apnoea, Hepatitis C

Note. [1] Participant's self-report data obtained from their Study 1 demographic information form; [2]BMI based on participants' self-reported weight and height; [3]BMI category: normal weight (BMI 20-24.99); overweight (BMI 25-29.99); obese class I (BMI 30-34.99); obese class II (BMI 35-39.99); obese class III (BMI $\geq$ 40) (World Health Organisation, 2006); [4]Duration of diabetes diagnosis: based on pre-defined categories used in demographic form: 0-4 years; 5-9 years; 10-19 years; 20 years or more.

Presented in Table 5.13 is Dianne's self-report depression level, PA participation (total weekly PA minutes), and exercise SOC during the study period.

Table 5.13

Dianne's Self- Report Depression Level, PA Participation, and Exercise Stage of Change

Measure	Measure outcome / Timeline	Baseline	Week 8 (LPAC intervention)	Week 12 (LPAC intervention)	Week 16 (follow-up)	Week 22 (follow-up)
HADS-D[1]	Depression Level	10	4	NA	NA	NA
SPAQ[2]	Total PA min per week	785	405	NA	NA	NA
SPAQ	Exercise SOC[3]	Prep	Prep	NA	NA	NA

Note.[1]HADS-D (Hospital Anxiety and Depression Scale-Depression subscale) score: Depression level categories: No (score 0-7), Mild (8-10), Moderate (11-14), Severe (15-21); [2]SPAQ (Scottish Physical Activity Questionnaire); exercise SOC categories: Precontemplation (Precont), Contemplation (Cont), Preparation (Prep), Action (Act), Maintenance (Main); NA: Not Available (participant did not complete and/or return the requested HADS and/or SPAQ measure for that corresponding week).

Dianne's Presenting Character Description

Dianne was enthusiastic about taking part in the LPAC intervention. In the baseline interview, she said that she lacked motivation for PA and she had been relatively inactive for at least 8 months prior to LPAC commencement. Nevertheless, she said that she wanted to increase her PA behaviour, and was hoping that participating in the intervention would provide her with the motivation she needed to act upon her intentions. Thus, for Dianne, it seemed the LPAC intervention would likely act as a tool for increasing her motivation, and initiation of PA. In the initial LPAC, Dianne's monotone and lowered voice suggested that she was experiencing elevated depression. She said that depression was something she had struggled with throughout her life. Consistent with her narrative was her baseline self-reported mild (just below moderate) depression level (HADS-D score of 10, see Table 5.13). Dianne also mentioned that she had (weight related) sleep apnoea and anxiety about her heart rate increasing. These psychological and physical factors indicated that increasing her PA behaviour would be

a challenge for her. Nevertheless, Dianne expressed her intention to increase her daily lifestyle PA in the coming weeks.

Dianne's Physical Activity Behaviour

Physical activity participation at Week 16. Unfortunately, despite her reported PA intentions, in the Week 16 interview, Dianne said that her PA level had "not [changed] a great deal" since the initial LPAC. She had experienced an initial increase in her PA motivation and participation in lifestyle activities, particularly during the LPAC intervention period, but this was not sustained after the 12-week LPAC intervention had ended:

> And like even things like parking my car further away from the shops than I normally do. Like I would hang around and get a park close up, I just park further away and walk…. Probably in the second or the third month. Like in that period [post-initial LPAC].

If anything, Diane's self-reported weekly PA amount at Week 8 (405 minutes) indicated that her PA participation had decreased since baseline (reported 785 minutes; see Table 5.13). Dianne mentioned various psychological barriers that impeded her continued PA participation: high level of depression, low motivation, and lack of enjoyment of solitary based PA's (e.g., walking). On a positive note, she also talked about her keenness to begin playing netball in the coming weeks: "One of the ladies did talk about starting up a team. She was going to see, but let's hope that that happens this season…"

Physical activity participation from Weeks 16 to 24. Again, despite her previously reported PA intentions, in the Week 24 interview, Dianne said that her PA level (or lack of) had remained unchanged:

> Ah, [my PA behaviour has been] not that good, I did walk for about half an hour the other day with my daughter, but I got a blister on my foot so I haven't been able to walk since…we haven't been playing cricket, or netball either.

She said that since the Week 16 interview, she had made the netball team, and was anticipating that "probably in about 4 weeks or something I'll be starting." Thus, Dianne was still anticipating future participation, rather than actual behaviour. PA barriers that she had experienced included work commitments, and her anxiety: "I've come to realise is that I have become anxious about my heart rate increasing." Similar to her previous experiences, low mood/elevated depression appeared to be the main factor hindering her PA participation. Therefore, in the Week 24 interview, Dianne again expressed a negative reciprocal relationship between her elevated depression (symptoms such as low motivation) and lack of PA:

> Well I think my mood has affected my physical activity. When I am feeling alright I can get out of bed and I can do things but when I am low I can't be bothered to do any kind of opportunistic activity or whatever.

Dianne also expressed depressive symptoms like low exercise self-efficacy, and a lack of self-worth, which impinged on her PA behaviour:

> I think possibly my mood. I have an exercise bike at home and I look at it and then I say no I can't stuffed…I've had that conversation where I know what's good for me and you know I've been diagnosed with sleep apnoea and actually it could have been better, but that connection between that and actually doing it is well yeah. It's that barrier whether I deserve it or not. Yeah I think I am battling me.

Dianne's Mood

Mood at Week 16. In the Week 16 interview, paralleling her initial increases in lifestyle PA, Dianne said that her (initially low) mood seemed to be improving:

> Yeah yeah it [mood] has [reduced]. It sort of was –I think it was fairly low and then it was quite good for a while there. And then I've had this period over the last 6 weeks. So probably through the intervention it's been quite good.

Her self-reported "no depression" at Week 8 (HADS-D score of 4) further supported her reflections. She mentioned several factors that contributed to her enhanced mood during this time: her increased (lifestyle) PA behaviour, going on a holiday, beginning a new job, and positive family relationships.

Unfortunately, around 10 weeks after the initial LPAC, Dianne reported work-related issues that resulted in heightened depression and she said that she had ceased PA participation. Therefore, at the time of the Week 16 interview, it was evident in Dianne's narrative (e.g., word choice, voice tone) that she was experiencing depression that was impacting all aspects of her life, not just her PA behaviour.

Mood from Weeks 16 to 24. When Dianne was reflecting on her mood during the Week 16 to 24 follow-up period, she said that in the month following the Week 16 interview her ongoing mood was very low, indicating it was "about 2-3 out of 10" (with 10 being no depression). She said "So in the last month I have had no motivation, you know crying a lot." Several factors played a role in her elevated depression: failed house inspection, Jury duty, and engaging in little/no PA participation. She was getting into her "old habits":

> I think because I have stopped it [physical activity] to, yeah, like I wasn't even playing cricket or doing any activity. I'm definitely sleeping more, you know

> I've got back into the old pattern of you know sleeping all weekend, anytime I could possibly sleep. I would sleep all day if I could.

Thus, as mentioned, experiencing depression was facilitating her inactivity, and being physically inactive was contributing to her depression. In the month prior to the Week 24 interview however, Dianne said that her mood had "gradually [changed] in a positive way", and suggested that her mood has been "pretty good…I would say a 7 or 8 [out of 10]." Importantly, when reflecting on her recent mood changes, she said "it is really good and I really feel it…And I really don't want to be like 10 or like above because that's too much I think." Consequently, at the time of the Week 24 interview, she said that she was not feeling depressed. Dianne attributed her increased mood to improved lifestyle and work conditions, and practising mindfulness skills: "I've found that like it has almost, like it has really dug me out of a hole". Nevertheless, it is important to acknowledge that although Dianne's gradual mood improvement at the time of the Week 24 interview was positive, as described in her PA experiences, for most of the intervention and follow-up period, Dianne expressed elevated depression. Thus, it is likely that her mood, at least leading up to the Week 24 interview, was still considered to be low. This however remains tentative, especially considering she did not return any of the self-report mood or PA measures during this follow-up period.

In summary, Dianne had experienced a high level of depression and no/low levels of PA for at least 8 months prior to taking part in the LPAC intervention. Reflecting on her experiences during the intervention and follow-up period, it seems that Dianne had continued to experience a negative reciprocal relationship between low PA and depression. Although participating in the LPAC was useful in enhancing her initial PA motivation and behaviour, it was unsuccessful in assisting Dianne to overcome her PA barriers (mainly depressive symptoms), sustain her PA behaviour, and

thus experience any psychological benefit from PA at least during the 12-week follow-up period.

Paula's Physical Activity Behaviour and Mood during the LPAC Intervention and Follow-Up Period

Presented in Table 5.14 is a summary of Paula's self-report demographic and health status information.

Table 5.14

Paula's Self-Report Baseline Demographic and Health Status [1]

Demographic/health characteristic	
Age (years)	55
BMI[(weight (kg) / height (m)) squared][2]	57
BMI category[3]	Obese class III
Birth country	Australia
Occupation	Home Duties
Duration of diabetes diagnosis (years)[4]	10-19
Other chronic illnesses	Depression, arthritis, high blood pressure and cholesterol

Note. [1] Participant's self-report data obtained from their Study 1 demographic information form; [2]BMI based on participants' self-reported weight and height; [3]BMI category: normal weight (BMI 20-24.99); overweight (BMI 25-29.99); obese class I (BMI 30-34.99); obese class II (BMI 35-39.99); obese class III (BMI $\geq$ 40) (World Health Organisation, 2006); [4]Duration of diabetes diagnosis: based on pre-defined categories used in demographic form: 0-4 years; 5-9 years; 10-19 years; 20 years or more.

Presented in Table 5.15 is Paula's self-report depression level, PA participation (total weekly PA minutes), and exercise SOC during the study period.

Table 5.15

Paula's Self-Report Depression Level, PA Participation, and Exercise Stage of Change

Measure	Measure outcome / Timeline	Baseline	Week 8 (LPAC intervention)	Week 12 (LPAC intervention)	Week 16 (follow-up)	Week 22 (follow-up)
HADS-D[1]	Depression Level	17	13	13	NA	11
SPAQ[2]	Total PA min per week	30	03	100	NA	NA
SPAQ	Exercise SOC[3]	Cont	Prep	Prep	NA	Prep

Note.[1]HADS-D (Hospital Anxiety and Depression Scale-Depression subscale) score: Depression level categories: No (score 0-7), Mild (8-10), Moderate (11-14), Severe (15-21); [2]SPAQ (Scottish Physical Activity Questionnaire); exercise SOC categories: Precontemplation (Precont), Contemplation (Cont), Preparation (Prep), Action (Act), Maintenance (Main); NA: Not Available (participant did not complete and/or return the requested HADS and/or SPAQ measure for that corresponding week).

Paula's Presenting Character Description

Paula was willing to participate in the LPAC intervention. In the baseline interview, Paula's word choice and voice tone suggested that she was experiencing a severe level of depression (which was reflected in her baseline HADS-D score of 17, indicative of a severe depression level, see Table 5.15). She mentioned that depression was something she had frequently experienced for most of her life - stemming from her childhood, and facilitated by her current, less than adequate (e.g., cramped) living conditions, and poor health. It had only been in recent years however, that she recognised the significant impact that her mental health was having on all aspects of her life, and acknowledged that she probably required professional assistance with her mental health. In the initial LPAC, it was evident that Paula was experiencing significant FL related to her morbid obesity and associated health problems (e.g., arthritis). For example, she had physical difficulty walking (e.g., very slow walking pace, and unable to climb stairs), and was out of breath even after several steps, needing to stop and rest for several minutes. Her readiness to increase her PA behaviour was also questionable. For example, during the LPAC intervention, Paula frequently got

caught up in a debate with herself about why she did not have motivation, and what was mentally stopping her from being active. It seemed that her search for answers was in some way, an excuse for her inactivity. She also questioned herself about whether she wanted to change her sedentary lifestyle, (and thus her physical capacity). Therefore, it was clear that Paula's physical and mental health would present particular challenges in her ability to increase her PA over the coming months, and any increases in her PA motivation or self-efficacy would indicate improvement.

Paula's Physical Activity Behaviour

Physical activity participation at 16 Week. Compared to her behaviour prior to, and during the intervention, at the time of the Week 16 interview, Paula's (lack of) PA behaviour remained relatively unchanged, and she had continued to live a sedentary lifestyle. Thus, her narratives suggested that her Week 8 self-reported (SPAQ) weekly PA amount of 03 minutes was a more accurate reflection of her actual PA participation, than her Week 12 self-reported amount of 100 minutes (see Table 5.15). Similar to her PA hindrances noted at baseline, physical health problems and depression were the main obstacles to her PA participation during the intervention and follow-up period (between Weeks 13 to 16). For example, Paula said that following the initial LPAC, she attended a hydrotherapy class, however, she did not sustain this behaviour: "Well I just wrote it off in the end. I suddenly realized that it was nearly the end of the term and I just thought…." Nevertheless, despite a lack of actual PA behaviour, Paula acknowledged that she had become more aware of the need to be active: "I really can't think of anything except as I said my overall mood has changed and my awareness has altered." For Paula, an increase in awareness was a positive finding, indicating progression in her readiness to increase her PA participation, which was further reflected in the progression of her self-reported SOC from baseline to Week 12 (i.e.,

contemplation to preparation, respectively; see Table 5.15). Furthermore, she was motivated to recommence hydrotherapy classes during the Week 16 to 24 follow-up period: “I’m doing it [hydrotherapy] this time. I am definitely doing it… Nothing is getting in the way this time”. Paula enjoyed water-based exercises, particularly given her FL, and associated difficulties with land-based activities.

Physical activity participation from Weeks 16 to 24. Unfortunately, during Week 16 to 24, Paula remained relatively sedentary. A high depression level continued to be Paula’s main PA barrier, over and above her apparent FL. For example, when reflecting on her experiences during the intervention and follow-up period, Paula commented “I just feel as if I have been really slack…getting around and doing things.” With reference to her slackness (a depressive symptom), she said:

> it [her slackness] had worsened in the last couple of months, I mean I would think there were times when I would sort of make myself get up and go and do something, or here I have a good example, I would wake up at something after ten on Saturday morning and I was supposed to be in the city at ten thirty, I thought good one Cyril, looked at the time and curled up and went back to bed…I guess that push is not there.

Paula was aware that her elevated depression was affecting her drive and motivation in all aspects of her life, not just PA:

> I haven’t put enough effort in to it and that is what I am saying, I find it hard just to use the word motivate, to think. I’m finding it hard to say yeah look I should do that and actually do it…but I am not actually doing it whereas in the past, I have been there and I have made myself do it…I mean why didn’t I push myself to jump up and get some clothes on and then jump in a taxi.

For Paula, social withdrawal in all life aspects was another evident depressive symptom, and likely contributed to her lack of attendance at hydrotherapy: "[I've] missed a few appointments with doctors and things". Additionally, she said:

> Just going out socialising thing has not increased at all, and that is what Saturday would have been, but again as I have said to [the Psychologist] I am conscious of the because of it all too. So there is a little bit of a mindfulness to sin for me, and [the Psychologist] and I had a bit of a chat about that so maybe I will be able to work something out.

Therefore, similar to previous months, Paula was likely experiencing a reciprocal relationship between low/no PA and depression. Although her average daily PA had remained relatively minimal, it is important to acknowledge that in the Week 24 interview, Paula talked about times when she was physically active (i.e., extra 5 minutes of walking on some days) during the 16-to 24-week follow-up period. For example, she said that her PA participation had "fluctuated…It's been some days and some weeks have been more than others." Her increased PA was related to attending more doctor's appointments during those times: "Well I have had to go out to the doctors and things a bit more so I have done those a bit more". Considering Paula's FL, habitual sedentary lifestyle, and associated low aerobic capacity, her slight increase in movement is noteworthy. Importantly, Paula acknowledged these increases, and they were meaningful for her. For example, prior to taking part in the LPAC intervention, she said her PA behaviour was "probably nonexistent". Therefore, in reflecting on her extra 5 minutes of daily walking , she said: "Well I guess I am pleased that I've done it [walking] and I'm doing it rather than thinking well heck I've got to do it or not getting around to doing it".

Moreover Paula said that taking part in the intervention had motivated her to make other healthful changes (e.g., increased frequency of checking her blood sugar readings): “I am doing the sugar readings more than I was.” This indicated that she wanted to improve her current health status, at least in ways she was able.

Paula’s Mood

Mood at Week 16. As previously discussed, Paula had frequently experienced elevated depression throughout her life. Encouragingly, during the Week 16 interview, Paula talked about improved living conditions (e.g., additional financial assistance, receiving “lite and easy” convenience meals) during the time since the initial LPAC, which she said had “made life a lot much easier”, and had positively impacted on her mood. As shown in Table 5.15, Paula’s self-reported depression level at Week 8 and Week 12 (HADS-D score of 13, indicative of moderate depression) was lower than her baseline HADS-D score of 17, which supported her qualitative accounts of mood improvements. She had also begun seeing a psychologist, and expressed enthusiasm to continue seeing the psychologist with the goal of improving her mental well-being:

> my overall mood has changed and my awareness has altered [over the last 4 months since the intervention]….I use to be down in the dumps and I was going to say I am feeling more awake but that’s not really the right word. I can’t think of how to describe it.

Paula’s positive steps to increase her mood, and the mood benefits she experienced (at least at the time of the Week 16 interview) needs to be acknowledged. Nevertheless, her monotone speech, depression history, self-reported moderate depression level (reflected by her Week 8 and 12 HADS-D score of 13), continuing assistance from a psychologist, and continued low/no PA level, suggested that her overall mood status was low.

Mood from Weeks 16 to 24. Unfortunately, in the Week 24 interview, Paula indicated during the previous 8 weeks, her depression level had increased: “I know at the moment I am letting things niggle a little bit at me. I am just very tired too...so I just keep plodding on”. Accordingly, she subjectively rated her current mood (out of 10) as “probably about 5 I would say [leaning] perhaps a little to the negative” end of the scale. Paula was optimistic however, that her mental health would improve. For example, when she was comparing her current experience of elevated depression, with her experiences prior to taking part in the LPAC intervention, she said “It has gone down, but it hasn’t gone down to the depths it has in the past…over a number of years. I think I have contained it better myself than I have in the past.” She also acknowledged that “it [her mood] will come good again, I know that”. Paula talked about non-PA related factors that were facilitating her mood improvement, including her continued meetings with a psychologist, receiving “lite and easy” convenience meals, and the weight loss she had experienced related to her diet. Furthermore, Paula’s decreased self-report HADS-D score of 11 (indicative of moderate depression) at Week 22 compared to previous self-report HADS-D scores (see Table 5.15) was consistent with her increased optimism in her ability to reduce her depression.

In summary, consistent with her experiences prior to taking part in the LPAC intervention, Paula continued to experience a negative reciprocal relationship between PA and depression for the majority of the intervention and follow-up period. Therefore, although participating in the LPAC intervention had enhanced her awareness of PA, it was not successful in assisting Paula with increasing sustained PA motivation or participation, particularly during periods of moderate to severe depression. On a positive note, in addition to her increased PA awareness, Paula indicated that she

benefited from participating in the LPAC intervention in other non-PA related ways, via the increased frequency with which she checked her blood sugar readings.

Group Level Results and Discussion

In this section, I discuss group level results from this study, and draw on findings from previous research. Specifically, I reflect on the reciprocal relationship between PA and mood that was evident in participants' experiences during the intervention and follow-up period. Then, to thoroughly evaluate the effectiveness of the LPAC intervention, I discuss particular strategies and intervention elements that participants reported were useful.

Reciprocal Relationship between Physical Activity and Mood

On the outset, to avoid confusion, a clarification of the use of the terms "depression" and "mood" in this section is warranted. During scheduled conversation, participants used both terms interchangeably. Examples of mixed terms included: low mood and high depression; and good, enhanced, or improved mood and low depression. Therefore, to better reflect participants' experiences, in this section, these terms are also used interchangeably.

Increased physical activity and improved mood. During the intervention and follow up period, most women (Clare, Kelly, Mary, Dianne, and Lucy) indicated mood benefits (e.g., reduced depression), which they indicated were partly derived from their PA participation. At the same time, the participants reported that improvements in overall mood facilitated their PA intention and participation during the intervention and follow-up period. Importantly, these participants expressed their desire to continue progressing with their PA, or (in the case of Dianne and Clare, to act upon their PA intentions) beyond the follow-up period. Evidence of the positive relationship between PA and mood is an encouraging finding from the present study, because overweight

women with T2DM and depression are a high risk population for inactivity and poor adherence to PA, and depression is a significant barrier to PA participation. A positive, reciprocal relationship between increased PA and improved mood has also been demonstrated in previous research involving similar populations, including older, overweight Australian women (Lee & Russell, 2003), and adults with T2DM (Mier, Medina, & Ory, 2007). A particularly noteworthy finding from the present study was that for the majority of the intervention and follow-up, although most participants were probably engaged in a lower level of PA than that recommended for physical health benefits (refer to Chapter 2, Table 2.1, of the present thesis for PA recommendations), they all still reported mood benefits associated with their PA behaviour. This reinforces previous research outcomes of the potential of even small increases in PA levels for enhancing mood (and reducing depression), independent of weight loss (e.g., Hamer, Stamatakis, & Steptoe, 2009), even among high-risk populations for depression, such as overweight women with T2DM. Also, the present study finding highlights that the amount of PA required for psychological benefits is not the same as that needed for physical health benefits. Therefore, health professionals and researchers should be aware of the possible psychological benefits of small increases in PA, and the reciprocal relationship between PA and mood. Moreover, the value of emphasising even small increases in PA is further emphasised by the possible additional health benefits if small bouts are accumulated throughout the day (e.g., NSW PCAL, 2010). The derived finding of psychological benefits from small increases in PA highlights the importance of a tailored psychological intervention, such as the LPAC intervention used in the present study, which takes into account individual preferences, abilities, and commencing PA level, rather than advocating a pre-determined PA type and duration that every individual may not initially be able to achieve.

Decreased physical activity and decreased mood. The inverse relationship between PA and mood was also conveyed by all participants, at some point, during the intervention and follow-up period. Furthermore, participants' individual accounts demonstrate that women who expressed high depression and/or low PA level at baseline (e.g., Paula, Dianne, and Lucy), described this negative reciprocal relationship between low PA and decreased mood more frequently, and said they had experienced longer periods of low PA and low mood during the intervention and follow-up, than other participants (e.g., Mary, and Kelly). Overall, evidence of this relationship supports previous research showing that regular PA is needed to sustain psychological and physical health benefits of PA (Anderson et al., 2009; Woodard & Berry, 2001). Many factors affect a person's mood and PA behaviour. For example, in the Week 16 and 24 interviews, participants identified a variety of PA and non-PA- related factors that impacted their mood and PA participation (refer to Table 5.2 and Table 5.3). Depressive symptoms (DS) and functional limitations (FL; such as cancer, overweight, arthritis and pain, and torn leg ligaments) however, were two frequently reported factors that negatively impacted participants' mood and PA level. Briefly, a functional limitation refers to any health problem that prevents an individual from carrying out a task, whether it be simple or complex (Escalante, Haas, & Rincon, 2005), in this case, PA. The finding that women frequently reported DS and FL was not surprising, considering all women were overweight, diagnosed with T2DM, reported depression (at least at baseline), and most reported additional health problems. Nevertheless, an encouraging finding was that participants' physical health problems were not always perceived as a FL, and for those who did report health problems as barriers, these limitations did not fully prevent their PA intention and/or participation.

With reference to depression, participants' narratives indicated that depression per se was identified as a PA barrier, and many of the other barriers noted seemed to be symptoms of depression, including low motivation for daily activity (not just PA), self-defeating thoughts, low PA self-efficacy, tiredness, low priority/lack of time, physical health problems, and the number of reported barriers. Participants' experiences during the LPAC intervention and follow-up period suggested that depression severity played a particular role in the effectiveness of the intervention, and the probability that participants would initiate and maintain PA. For example, for the participants (Paula and Dianne) who expressed high depression for the majority of the LPAC intervention and follow-up period, participating in the LPAC intervention had assisted with increasing awareness of the need to be active, which lead them to raise their intentions to be active. They were always describing their future intentions for PA, yet did not act upon their PA intentions, or at least sustain any initial attempts. It is important to highlight that overweight women with T2DM *and* depression are less likely to engage in PA than similar women without depression, as found in previous research (ABS, 2009; Koopmans et al., 2009; Lin et al., 2004). Thus, current study outcomes support these findings. That is, women in this study who reported high depression at baseline reported lower levels of PA than those whose depression level was not as severe. At any rate, these findings demonstrate the difficulty of increasing PA participation and adherence in this population. Moreover, it appears more is needed (than the LPAC intervention) to assist initially-sedentary, overweight women with T2DM experiencing a high level of depression with their *actual* PA behaviour. Possible suggestions for ways the LPAC intervention could be improved are discussed in the *Future Research* section of this chapter.

Physical Health Problems and Functional Limitations

Examining physical health problems and FL were not aims in the current study. It is, however, important to highlight that overweight women with T2DM are a high risk population for physical health problems and FL. Additionally, experiencing depression can negatively increase physical health problems as being (actual and perceived) FL preventing PA. Thus, because the present study was aimed at increasing participants' PA behaviour, I consider it important to discuss the positive finding observed in this study regarding participants' perceived FL and their physical ability. Specifically, an encouraging finding was that no participant explicitly mentioned T2DM, a chronic health problem for all participants, as directly or indirectly (e.g., via associated health problems) preventing their PA participation, or influencing their mood. This may have partly been because T2DM health advice (e.g., provided by health professionals, such as diabetes specialists) includes regular PA. This could have led them to conclude that their T2DM may not, in itself, be a hindrance to PA. Another possible explanation coincides with a proposal by Larrson and Mattson (2001) regarding chronic health problems and people's *perception* of FL. Applied to the current context, what Larrson and Mattson proposed was that given the chronic nature of T2DM (and likely associated health problems), participants may "know no different", therefore, they do not perceive their health problems as being a FL. Consequently, it is possible that participants did not mention their T2DM as hindering their physical capabilities or negatively impacting their mood.

Participants' perceived FL and physical abilities also correspond with Sharma and Kuhsner's (2009) proposed clinical staging system of obesity. Specifically, Sharma and Kuhsner proposed the need to take into account each individual's (perceived and actual) FL, rather than grouping people's abilities based on their BMI alone, when

recommending appropriate PA and treatments for obese individuals. For example, all participants in the present study were considered overweight or obese, based on their self-report BMI, yet they all had notably different PA experiences. For some women (e.g., Kelly, Clare, Lucy, Mary) their body weight even facilitated (e.g., for weight loss), rather than prevented, their PA behaviour. The degree of perceived and actual physical ability also varied among these participants, even between two participants (Paula, Lucy) who, based on their BMI, were considered morbidly obese (BMI obese class III). For example, Paula's body weight clearly physically restricted her ability to move. For her, even 5 minutes of extra daily walking was a notable improvement. Similarly, in the initial LPAC, Lucy reported, and displayed, difficultly in her movement. During the LPAC intervention and follow-up period however, despite her weight and other physical health problems, such as arthritis and associated pain, Lucy substantially increased her PA behaviour in ways that she was able (e.g., water-based activity), which improved her functional ability (e.g., walking). Thus, although these two women were both considered obese class III, they each likely had different (actual and perceived) FL, and, thus, PA experiences.

The finding, in the present study, of different PA experiences noted by women is consistent with previous research outcomes, which have shown that psychological interpretation of illness is subjective, and can vary throughout the course of illness (Brannon & Feist, 2009; Bussing & Fischer, 2009; Farber, Mirsalimi, Williams, & McDaniel, 2003; Furze, Roebuck, Bull, Lewin, & Thompson, 2002). The way a person interprets their illness is influenced by a variety of intrapersonal, disease-related, and environmental factors, and holding a positive or negative perception may influence the person's choice of coping strategies to manage the illness (e.g., engaging in suitable activities, and seeking regular support, or, avoidance of coping by not adhering to PA or

seeking support), and, thus, disease progression and prognosis (Bussing & Fischer, 2009; Furze et al, 2002). Leventhal's self regulatory model (SRM) of illness behaviour (Leventhal & Cameron, 1987) also demonstrates the complexity of behaviour. Briefly, according to SRM, there are three stages that regulate behaviour: interpretation (e.g., cognitive representation of the threat/illness, including symptom perception, possible causes and consequences); action plan or coping strategy (e.g., one's approach to coping, or avoidance strategy); and appraisal (e.g., utilising specific criteria to gauge the success of coping actions, with perception of insufficient progress leading to modification; Pitts & Phillips, 1998). Therefore, perceived and actual FL are important factors to consider when making PA recommendations for individuals with physical health problems, which are likely among overweight women with T2DM and depression.

Furthermore, findings from the present study *extend* Sharma and Kushner's (2009) staging system. Specifically, their proposed staging system focuses on the physical limitations associated with weight status when assessing one's physical ability to engage in PA. Outcomes from the present study demonstrate there is also a need for psychological assessment, particularly regarding people's attitude and PA self-efficacy about their ability. For example, all six women in the present study were experiencing at least two health problems (e.g., overweight, T2DM, cancer, and/or arthritis and associated pain). Some participants (Lucy, Kelly, Clare) did explicitly acknowledge their health problems as relating to FL, which did physically limit them and thwart their motivation, at least initially. Nevertheless, these women did not view their (perceived or actual) physical restriction/s as a barrier fully preventing their PA participation. They still remained optimistic about what they *could* do, and continued to progress with their

PA participation during and following the LPAC intervention in ways (e.g., swimming), and on occasions (e.g., coinciding with health improvement) when they were able.

Moreover, these findings provide support for the utility of a psychological intervention, such as the LPAC, for overweight women with T2DM and depression. Specifically, taking part in the LPAC intervention likely contributed to participants' positive perception and attitude regarding their ability to undertake PA, for example, by providing the opportunity to gauge and overcome their perceived and actual barriers, including physical restrictions (e.g., associated with body weight or arthritis), identifying and encouraging suitable activities they enjoyed, and increasing their PA self-efficacy.

Evaluation of the LPAC Intervention on the Health Behaviours of Overweight Women with Type 2 Diabetes Mellitus and Depression

Influence of LPAC Intervention on Health Behaviours other than Physical Activity

In the present study, investigating the influence of the LPAC intervention on health behaviours other than PA was not a primary focus. Nevertheless, this was a positive and valued finding that warrants attention. Specifically, two women (without prompt) credited the LPAC intervention for increasing their participation in other health behaviours important for diabetes and weight management, including more regular blood sugar reading (Paula), and improved dietary habits (Clare). For example, although Paula remained relatively inactive throughout the study period, she said that participating in the LPAC intervention helped her to remain aware of the need to be active, but also prompted her to increase and sustain the frequency of her blood sugar readings. Perhaps for Paula, increasing the number of blood sugar readings she took, which requires little physical effort/exertion, was a way she was able to feel like she was doing something to improve her health status, in particular, her diabetes

management, despite her lack of PA. Thus, by participating in the LPAC intervention, she was still able to have mastery experiences, and increase her self-efficacy in other ways. This is an important finding. Although the focus of the LPAC intervention was on promoting PA participation and adherence, the positive carry-over effect of the intervention to other health behaviours demonstrates its flexibility and suitability for populations at high risk for inactivity, who may not initially be able to engage in a level of PA for health benefits, or experience mastery experiences with their PA participation. Nevertheless, the LPAC intervention, evidently made them feel empowered in other ways, such as participating in other more immediately achievable health behaviour changes.

Diet is a variable that was neither controlled nor systematically monitored in this study. The dietary changes made by Clare, and frequent verbal and written reporting of dietary changes by other participants (e.g., Mary and Lucy, although these women did not credit participation in LPAC for their dietary habits) are not surprising, however. PA and diet are well known key factors for weight loss (Wing & Hill, 2001; Wing & Phelan, 2005), and these women were overweight and expressed desire to lose weight. I was not able to determine whether the intervention directly (and if so, through what particular strategies) and/or indirectly (e.g., via their associated PA behaviour change) influenced initiation of this health behaviour change. At any rate, the reported influence of participating in LPAC on healthful dietary changes again demonstrates the utility of the LPAC intervention for improving various aspects of health, particularly those related to diabetes and weight management, in this population. Further research should explore the particular strategies or aspects of the intervention that contributed to broader behaviour change for this population.

Influence of LPAC Intervention on Physical Activity Awareness, Motivation, and/or Participation

An important and encouraging finding was that all women acknowledged that the LPAC intervention had a positive impact on their PA awareness, motivation, and/or participation. For example, one participant (Kelly) said "if I hadn't done the intervention it would probably have taken me longer to get motivated to do things….Oh I think it helped enormously". Increases in PA following an exercise/PA consultation intervention have been found in the general population (Lowther, Mutrie, & Scott, 2002), in individuals with CHD (Hughes et al., 2002; Hughes et al. 2007; Rogerson, 2009), and in people with Type 1 diabetes (Hasler et al., 2000) or T2DM (Jackson, Asimakopolou, & Scammell, 2007; Kirk et al., 2001; Kirk et al., 2004). Similar to the present study, Hughes et al. (2007), Kirk et al. (2004), and Rogerson (2009) utilised PA consultation interventions in their studies. The main differences between the studies by Hughes et al. and Kirk et al. and the present study were the duration of the intervention, the inclusion of a control group, the sample size, and inclusion of objective measures of PA. Hughes et al. and Kirk et al. had larger sample sizes than the present study, included a non-treatment control group, and measured PA using a self-reported measure and accelerometer readings. The basic structure of the interventions reported by Hughes et al., Kirk et al., Rogerson, and the present study was similar, with all studies having face-to-face consultations at baseline and follow-up telephone calls. In addition to the baseline consultation, however, Hughes et al. and Kirk et al. had a second face-to-face consultation at 6 months and follow-up telephone calls occurring at 3 and 9 months for Hughes et al., and 1, 3, 7, and 9 months for Kirk et al. Moreover, unlike the present study, Rogerson included fortnightly follow-up telephone calls during the 12-week follow-up period. Although shorter in time, the present study included perhaps a less

demanding intervention phase, with two follow-up calls for the 12-week intervention period (note: in the present study, consultation follow-up calls were labelled “LPAC support phone calls”. This label was used to make it clearer that these phone calls were part of the intervention, and not the follow-up period after the intervention had ended). In terms of increasing and maintaining PA intention and participation, future research could examine the effectiveness of shorter, less demanding interventions, such as that used in the present study, compared to longer interventions implemented by Hughes et al. and Kirk et al., and more intense interventions like the one reported by Rogerson. Findings from such research would be particularly valuable for health care settings where resources (e.g., staff, time, finances) are limited. As discussed later in this chapter, however, certain factors inherent in the individual (e.g., psychological readiness to be active, depression level) seemed to influence the effectiveness of the LPAC intervention in increasing participants’ PA participation in the present study.

In the following paragraphs, the strategies and elements of the LPAC intervention that participants noted as being particularly beneficial in their PA behaviour and mood are discussed. These strategies include education about PA benefits and types; identifying and encouraging activities participants enjoyed; decisional balance; goal setting; recognising and overcoming PA barriers; and social support and encouragement from the researcher. Particular intervention elements that were noted from the interview reports of participants included receiving LPAC support phone calls; and periodically completing self-report measures. For discussion purposes, I am presenting these strategies and elements of the LPAC intervention individually. It was evident however that in some cases, the combination of several strategies, rather than one technique alone probably played a role in influencing thoughts, feelings, and behaviour.

Education about physical activity benefits and options. Being educated about, or reminded of, the different PA types, recommendations for health, and associated benefits was a strategy that participants acknowledged as a useful component of the intervention, particularly for increasing their motivation. Consistent with Blair and Church's (2003) recommendations for promoting PA among sedentary individuals with T2DM, I did not emphasise weight loss oriented benefits. I considered this to be particularly important for the present study sample, because they were all overweight or obese, and were unlikely to be engaging in a level of PA (intensity or amount) required for weight loss, at least during the intervention and follow-up period. A focus on weight loss under these circumstances could have had negative impact on key factors, including depression and motivation to undertake PA. Also I tailored the information depending on participants' needs and base knowledge. For example, some women had a broader knowledge than others of different types of PA and their benefits, and/or a better understanding of the PA recommendations. Nevertheless, all women still valued being informed or reminded of these factors. Cognitive strategies (e.g., education), have been shown to be particularly useful for facilitating PA participation among individuals in the early stages of behaviour change (i.e., contemplation or preparation; Ruppar & Conn, 2010). Therefore, the positive influence of education for participants in this study may, in part, have been because most participants, at LPAC commencement, were considered to be in an early SOC regarding increasing their PA behaviour, thus, receiving information in favour of increasing PA (e.g., health benefits) likely assisted their motivation and willingness to be active, at least initially.

Identifying and encouraging activities the individual enjoys. All women were motivated to and/or initiated participation in activities they enjoyed. This is an encouraging finding. Numerous previous research outcomes have shown that

encouraging participation in PA types the individual enjoys helps to facilitate their intrinsic motivation, increasing the likelihood that the individual will participate in and adhere to PA (Frederick-Recascino & Morris, 2004; Jewson, Spittle, & Casey, 2008; Rhodes et al., 1999). Moreover, engaging in preferred activities is more likely to change one's perception of PA from a "should" to a "want" (Berger, 2004), that is, from identified regulation or integrated regulation, as described by Deci and Ryan (1985) in self-determination theory. This is important, particularly for high risk populations for inactivity and relapse, and further demonstrates the suitability of strategies that foster intrinsic motivation for these overweight women with T2DM and depression.

Decisional balance strategy (DBS). One participant (Kelly) explicitly stated the DBS, a cognitive strategy, assisted her decision to increase her PA behaviour. It was likely, however, that most participants benefited from this strategy, at least initially, in their readiness and motivation to become more active, because DBS was used in conjunction with other valued strategies (e.g., identifying and overcoming PA barriers). Cognitive strategies that assist individuals in their decision and readiness to engage in PA are important, particularly for sedentary individuals with a high risk of relapse, such as overweight women with T2DM and depression, who may not be able to greatly increase their PA behaviour (e.g., due to low fitness), at least initially. Thus, the explicit and implicit benefit of DBS supports PA consultation recommendations (Kirk et al., 2007; Loughlan & Mutrie, 1995) and previous researchers who found this strategy to be useful for assisting individuals to increase their readiness to engage in PA (Hoyt & Janis, 1975; Kirk et al., 2007; Marcus, Rakowski, & Rossi, 1992; Prestwich, Lawton, & Conner, 2003; Wankel & Thomson, 1977).

Recognising and overcoming individuals' physical activity barriers. All women (explicitly and implicitly) acknowledged the usefulness of recognising and

overcoming their PA barriers in increasing their PA motivation and participation. Perhaps identifying ways to overcome their PA barriers assisted with increasing participants' PA self-efficacy, motivation, and readiness to be active. Also, the derived information was used to complete other strategies, such as goal setting, and devising their lifestyle plan. Regardless of the underlying mechanism, the benefit of this strategy for participants corresponds with existing research outcomes, which suggests its usefulness for promoting PA, particularly for people in the earlier SOC, and in various populations, including women (Ransdell, Dinger, Huberty, & Miller, 2009), people with T2DM (Kirk et al., 2007), and individuals who are overweight or obese (Ainsworth & Youmans, 2002).

Goal setting. Realistic and achievable goal setting was a behavioural strategy used by all participants in their initial LPAC. Additionally, as previously mentioned, I encouraged participants to identify process-oriented goals (i.e., those related to the act of performing the PA, such as increasing, over time, the minutes engaged in the PA), rather than outcome-oriented goals (e.g., weight loss). One participant (Lucy) explicitly said that she found goal setting useful, because it increased her motivation, and gave her something to work towards. It is likely, however, that most, if not all, women benefited from this strategy. For example, goal setting was also completed in conjunction with other strategies (e.g., DBS, overcoming PA barriers, and participants' lifestyle PA Plan). Furthermore, participants' progression toward their goals, or for some, modification of their original PA goals, was a frequent topic of conversation in the LPAC support phone calls. Numerous previous studies have also shown goal setting to be an effective strategy for increasing PA, including among people in primary care settings (Ainsworth & Youmans, 2002; Green et al., 2002.), older adults (Chao et al., 2000), individuals with CD (Seime & Vickers, 2006), and people with chronic illness

(e.g., CHD, T2DM; Kirk et al., 2007; Rogerson, 2009; Ruppar & Conn, 2010). Furthermore, the positive influence of goal setting and breaking down goals into achievable tasks on some participants' PA behaviour supports Bandura's (1986) self-efficacy theory, for example, by providing opportunities for mastery experiences.

Nevertheless, consideration does needs to be given to the low explicit support for goal setting. The lack of support, in part, may have been because at baseline, all participants' self-reported data indicated that they were in an early SOC; contemplation or preparation), which was also inferred from their narratives. Compared to behaviour strategies, cognitive strategies have been found to be more useful for people in the earlier SOC, to help them mentally prepare for their PA behaviour change (Kirk et al., 2007). Theoretically, this explanation would appear likely, although it was not explicitly tested in this study, especially considering that most women valued completing the self-report PA measures, which are often used in PA adherence interventions as a self-monitoring behavioural strategy (Ruppar & Conn, 2010). Further research is needed to evaluate the effectiveness of all components of the LPAC intervention (strategies and techniques).

Furthermore, the participant (Mary) who reported being regularly active prior to the LPAC intervention was content with her existing PA regimen, and weight-loss was her main PA motivation and goal. Mary's focus on weight loss remained unchanged during the intervention and follow-up, despite the encouragement I gave her during the intervention to identify and work toward a process-oriented goal. This highlights the problem that even though we can steer a person to specific, achievable, process goals, they might still aim to "lose weight". Moreover, Mary's focus on weight loss highlights that it may not be goal setting per se that is effective, but setting appropriate goals that is effective. Previous research has shown that outcome-oriented goals (e.g., weight loss)

are less likely to foster PA adherence than process-oriented goals (Berger, Pargman, & Weinberg, 2007). Thus, Mary's weight loss goals may have contributed to her frequently reports of missing planned PA sessions. Moreover, participants' reliance on memory when reflecting on useful elements of the LPAC intervention (in the Week 16 and Week 24 interviews) may have contributed to the low number of women who mentioned this strategy At any rate, participants' explicit and indirect accounts support existing research evidence suggesting that goal setting is a valuable strategy in psychological interventions for overweight women with T2DM and depression, particularly when the general goal is achievable, process-oriented, and broken into small and achievable tasks.

Verbal support and encouragement from the researcher. During the LPAC intervention, I praised participants' past and/or current PA attempts, and encouraged any of their indications that were in line with increasing their PA behaviour (e.g., their suggestions about ways they could increase their PA behaviour). The primary aim of this verbal strategy was to enhance participants' PA self-efficacy. Encouragingly, half of the participants (Clare, Lucy, and Kelly) highlighted that this support and encouragement had a positive influence on their PA motivation and behaviour. This finding supports Bandura's (1977, 1982) self-efficacy theory by demonstrating the importance of enhancing peoples' confidence in their ability to initiate PA behaviour change (Prochaska & Marcus, 1994). This is particularly important for individuals who are at high risk of inactivity and relapse, and those who are experiencing psychological PA barriers (e.g., depressive symptoms, low self-efficacy). It is likely that more, if not all, participants benefited from the support and encouragement provided, as part of the intervention, because although this was a verbal strategy in its own right, it was also intricately linked to the positive influence of the LPAC support phone calls, as well as

all other LPAC intervention strategies (e.g., education, recognising and overcoming PA barriers, goal setting, and devising their PA plan). The explicit and implicit acknowledgement of this verbal strategy is consistent with other research, which has also shown that health professionals play a key role in the PA behaviour of older adults (Balde, Figueras, Hawking, & Miller, 2003; Booth, Bauman, Owen, & Gore, 1997; Rosqvist et al., 2009; Schutzer & Graves, 2004), and people with depression (Faulkner & Biddle, 2004; Hathaway et al., 2005, as cited in Seime & Vickers, 2006). Therefore, corresponding with current PA consultation guidelines (Kirk et al., 2007), experiences of women in the present study also demonstrate the importance of assessing and facilitating the individual's self-efficacy, particularly by verbal means, in interventions aiming to promote PA participation for overweight women with T2DM and depression. Furthermore, this finding highlights that although PA consultation interventions can be delivered by any health care professional/researcher with minimal training in the delivery of cognitive and behavioural interventions and knowledge of PA for the specific population, for intervention success, it is crucial that the health practitioner/researcher has excellent communication and listening skills, and an environment of trust and support is developed (Loughlan & Mutrie, 1995).

LPAC support phone calls. Two participants (Kelly and Dianne) explicitly mentioned that receiving the LPAC support phone calls (and thus the conversations in these calls) enhanced their PA motivation and/or encouraged participation. Additionally, Dianne, who expressed high depression for most of the follow-up period, said she found talking about her mood useful. As previously mentioned, although I have presented the verbal strategy support and encouragement as a separate strategy, it is not easily distinguishable from the LPAC support phone calls in which much of the support and encouragement took place. At the same time, from their comments, it does seem

evident that the participants also appreciated the opportunity to talk about their experiences, as well as having the sense that somebody was listening to them. Nevertheless, the finding that these women explicitly acknowledged the value of receiving the phone calls supports the LPAC intervention design (e.g., type, mode, and frequency of contact with the researcher) used in the present study; and previous research that also included at least two phone calls post-consultation (Chun-Ja, Hwang, & Yoo, 2004; Kirk, Mutrie, MacIntyre, & Fisher, 2003, 2004; Rogerson, 2009).

Periodic completion of self-report physical activity measures. In the present study, periodic completion of self-reported depression (HADS) and PA (SPAQ and PA log) measures was used for data collection purposes, to get an indication of participants' self-report depression level and PA behaviour during the study period. Nevertheless, most participants identified the self-report PA measures to a beneficial element of the intervention. For example, they reported that completing the self-report PA measures acted as a constant reminder and prompt to be active; and/or as an objective gauge of their PA participation. The overall positive influence that completing the measures had on participants' PA awareness and behaviour corresponds with existing research outcomes suggesting self-monitoring to be an effective behavioural strategy for promoting PA in various populations, including older adults (Conn, Valentine, & Cooper, 2002), and adults with chronic illness, such as T2DM (Ruppar & Conn, 2010). For example, Ruppar and Conn conducted a meta-analysis (involving findings from 163 studies) to identify the most effective strategies and practices to promote PA in people with chronic illness, such as T2DM. According to their meta-analysis outcomes, strategies involving self-monitoring significantly improved the effectiveness of interventions aimed at promoting PA, regardless of other strategies employed (Ruppar & Conn, 2010).

Despite the notable support for the inclusion of the self-report measures, attention needs to be given to the finding that not all participants found the measures beneficial, and there were individual differences in participants' preferences for the frequency of filling in the measures. For example, one participant (Dianne) talked about the negative experience she had with completing the measures. She said that because she did not sustain her initially increased PA level, and experienced elevated depression for most of the study duration, the requirement of periodically completing the measures made her feel worse, creating undesirable dissonance between the little/no PA she was engaging in, and the level of PA she knew that she *should* be doing to obtain health benefits. Moreover, she felt shame and guilt for not completing the measures. Thus, inclusion of PA self-monitoring tools may have the opposite effect by increasing depression, and hindering PA participation for those who are not meeting the goals they have set. In contrast to Dianne's experiences however, another participant (Paula) who also experienced a high level of depression, and a low level PA for the majority of the study period, said that she found the self-monitoring useful in increasing her PA awareness. Paula suggested that increasing the frequency (e.g., to weekly) of completing the self-reported measures might have assisted her with increasing her actual PA behaviour. To further demonstrate the noted individual differences in response to the measures, another participant (Kelly), who increased her PA behaviour and reported positive mood changes during the intervention and follow-up period, commented that although she found completing measures beneficial, she would have preferred a less frequent (e.g., fortnightly) requirement of filling them in. Therefore, the overall effectiveness of self-monitoring on PA awareness and behaviour among women in the present study suggests the utility of self-report measures for self-monitoring as a possible strategy for promoting PA among overweight women with T2DM and

depression. Nevertheless, differences in participants' experiences with respect to completing the measures highlight the need to take into account factors, such as the individual's preference, self-efficacy for managing PA, depression level, and/or PA level, when determining the suitability of self-monitoring techniques for assisting with their PA initiation and participation. It also highlights the need to monitor regularly what effects completing the measures have on the individual's mood and PA participation. Moreover, the individual differences further demonstrate the value of a tailored psychological intervention for promoting PA among this population.

Changes in Physical Activity Stage of Change (SOC) Over Time

Another way of assessing the effectiveness of the LPAC intervention in assisting participants with their PA participation is to examine changes in their level of readiness to engage in PA, obtained via participants reported SOC. This information is displayed, in table format, for each participant in the individual level analysis section. In the present study, no participant reported being in the pre-contemplation SOC, which is not surprising, given the study topic. It is unlikely that someone would volunteer to take part in a PA adherence intervention, if they had not thought about increasing their PA level (Jackson, Asimakopolou, & Scammell, 2007). Other studies that have utilised exercise/PA consultation interventions have also reported this finding (e.g., Hughes et al., 2007; Jackson et al., 2007; Kirk et al., 2004; Rogerson, 2009). Although PA consultation could assist people in the pre-contemplation SOC to become more active, PA consultations are primarily designed to assist people who are in the contemplation, preparation, action, and maintenance SOC (Kirk et al., 2007; Loughlan & Mutrie, 1995).

Because of the small sample size and incomplete return of self-report measures during the study period, group analysis of quantitative data was not feasible in the

present study. Nevertheless, a positive finding was that the majority (4 out of 6) of participants showed progress in their self-reported SOC during the 12-week LPAC intervention. Specifically, two individuals (Paula and Lucy) who reported being in the contemplation stage at baseline, and two individuals (Kelly and Marry) who said they were in the preparation SOC at baseline; had progressed to the next SOC (preparation or action respectively) at the end of the 12-week intervention period. This is consistent with previous RCT pilot studies that have shown PA consultation to be successful in short-term progression in exercise behaviour SOC in people with T2DM (at 5 weeks post-consultation; Kirk et al., 2001), and people with Type 1 diabetes (at 3 weeks post-consultation; Hasler et al., 2000). For example, in the RCT of individuals with T2DM, at 5 weeks follow-up, Kirk et al. found that 55% (6/11) of the participants who had received an PA consultation had progressed to an action SOC compared to 8% (1/12) of those in the control condition (Kirk et al., 2001). Another important finding in the present study was that of the five participants who returned their Week 22 self-report measures (one participant, Dianne, did not return any of her measures during the follow-up period) all had either maintained or progressed with their SOC during the follow-up period. Specifically, compared to participants' Week 12 self-report SOC, at Week 22, three participants (Clare, Paula, and Lucy) had remained in preparation SOC, and one participant (Kelly) remained in action SOC. Moreover, one participant (Mary) reported general progress to the maintenance SOC by Week 22. Thus, of the participants who did return their follow-up self-report measures, none had regressed to their baseline SOC. This positive finding might be explained by the Week 16 interview, which could have acted in the way the LPAC support (Week 8 and 12) phone calls did during the intervention period, even though that was not the intention of the interview. Outcomes from some previous research, however, have also demonstrated progress in exercise

SOC at 24 weeks post-consultation in people with T2DM (Jackson et al., 2007), and 12 months post-consultation in people with Type 1 diabetes (Hughes & Mutrie, 2007) and T2DM (Kirk et al., 2004).

Overall, participants' self-report SOC suggests the LPAC intervention assisted most participants in the earlier SOC (contemplation, preparation) to progress to the next SOC, at least during the 12-week intervention period. Moreover, participants had either maintained, or progressed further with their SOC during the follow-up period. This indication of a psychological shift in participants' intention to initiate PA participation is encouraging. As previously mentioned, overweight women with T2DM and depression have a high risk of inactivity and poor adherence to PA. Experiencing depressive symptoms (e.g., lethargy, low self-efficacy) alone is a significant barrier to initiating PA (Kyrios et al., 2006; Seime & Vickers, 2006**)**, which was demonstrated in both the previous study (presented in Chapter 4), and among participants in the current study. Therefore, it is not surprising that the majority of changes in perceived SOC for participants in this study were noted in the earlier SOC, which is indicative of cognitive changes in readiness to be active, rather than in the latter SOC (e.g., action, maintenance), which reflects actual behavioural change. In previous research involving cardiac patients, which involved a similar intervention design to that used in the present study (e.g., 12-week intervention period consisting of a single PA consultation plus fortnightly phone calls; and a 12-week post-intervention follow-up period), Rogerson (2009), also found that cardiac patients with depression were much more likely to be in a lower SOC (e.g., contemplation or preparation) during the 24-week study period than those without depression (who were more likely to be in the action or maintenance SOC (Rogerson, 2009).

Caution is needed when interpreting findings based on participants' self-report data. For example, in this study there was inconsistency between participants' PA level and SOC reported on the SPAQ. Additionally, notable disparities between three participants' (Paula, Lucy, and Mary) quantitative (SPAQ) and qualitative (interview) data concerning their likely SOC highlight the advantages of qualitative study designs, such as the one used in the present study, when examining and interpreting the effectiveness of interventions for facilitating SOC progression. For example, according to Lucy's self-report data, she remained in preparation SOC during the follow-up period, yet, based on her narratives in the Week 16 and 24 interviews, Lucy described a significant increase in her PA behaviour, which suggests that she progressed to the next SOC (e.g., action) beyond the point where the LPAC intervention stopped at Week 12. Helping people to progress even one stage higher on the SOC model has been shown to double their chance of successful action on the target behaviour in the near future (DiClemente et al., 1991). Moreover, positive cognitive (psychological) change in intention to undertake PA has been shown to be more likely to result in actual PA participation and adherence (Delahanty et al., 2006). Maintaining regular PA, at a level recommended for physical health benefits, is important for overweight women with T2DM and depression. Therefore, the finding that all women reported progression in their self-reported SOC, which was supported by their qualitative accounts during the intervention and follow-up periods, is a noteworthy finding. It should be acknowledged however that the noted inflation in participants' self-reported PA, and incomplete self-report PA data provided by some participants at Week 16 and 24, prevents an accurate indication of participants' actual PA level. Although participants' qualitative accounts suggested that they were unlikely to be achieving the recommended level of PA for health benefits, compared to participants' pre-intervention PA behaviour, their

qualitative accounts at Week 16 and Week 24 suggested that they had each made progress in their PA intentions and/or behaviour.

In summary, based on participants' reported PA participation and perceived SOC, the 12-week LPAC intervention seemed to be effective in increasing PA motivation, intention, and behaviour (at least 3 to 6 months post-initial LPAC) among the six overweight women with T2DM and depression in the present study. There appear, however, to be particular factors that require consideration when tailoring the LPAC intervention to assist with initiation and action for PA participation for this population. These include the individual's depression level, perceived and actual FL (e.g., health problems, such as arthritis, pain, obese status), and their level of readiness to engage in PA. Considering this, outcomes from the present study also provide *some* support for the proposed intervention recommendations (which are consistent with the cognitive and behavioural strategies used in the LPAC intervention) that have been put forth for promoting PA among people with T2DM and depression (Seime & Vickers; Vickers et al., 2006), and to facilitate PA and reduce depression among people with depression (Donaghy, 2007). Importantly however, findings from the present study also *contribute* to, and thus *extend,* existing guidelines and intervention recommendations put forth by Vickers et al. and Donaghy for people with depression. Specifically, it appears that more is needed than the LPAC intervention presented to assist women with their PA motivation and participation during periods of elevated depression. For example, at some stage during the intervention and follow-up period, all participants indicated a negative cycle between depression and low PA. In particular, two participants (Dianne and Paula) experienced moderate to severe depression and a low level of PA for the majority of the follow-up period. Both of these participants indicated they had experienced this cycle for at least 6 months prior to taking part in the LPAC

intervention. Participating in the LPAC intervention was not sufficient to assist them to initiate or sustain any initial increases in PA during the follow-up period. For example, Dianne said:

> I suppose that I thought by joining [taking part in the intervention] it would get me more motivated, but I don't know if I had too high expectations of it or what…Like you could have an electric cattle prod and prod me out of bed.

This is an important consideration, because there is a high risk of elevated depressive symptoms and inactivity for overweight women with T2DM. Moreover, such women with increased depressed mood would likely benefit most from PA: physically (e.g., improved diabetes and weight management, and physical functioning) and psychologically (e.g., reduced depressive symptoms, enhanced well-being).

Methodological Issues

In this section of the chapter, I discuss methodological issues related to the present study. I refer to strengths of the study, and make suggestions for how the limitations could be overcome in future research.

The Week 16 and Week 24 follow-up interviews were conducted 4- and 12-weeks (respectively) after the LPAC intervention had ended. In these follow-up interviews, participants were asked about particular strategies and elements of the intervention they found useful in assisting with their PA behaviour. To ensure their responses were not influenced or directed in any way toward a particular strategy or element, I asked open-ended and neutral questions. Although participants highlighted specific strategies and intervention components they found useful in assisting with their PA behaviour, their responses may have been influenced by the need to rely on their memory. Therefore, not providing more specific questions to remind them about the strategies may have meant that other equally effective strategies were not mentioned

(e.g., the 7-day lifestyle PA plan all participants devised). For example, one participant (Mary) found the LPAC intervention beneficial; however, she could not recall any particular aspect of the intervention that was particularly useful in assisting her to maintain her reported regular PA participation. Thus, future researchers should consider ways to minimise possible oversight of effective strategies/components relating to the intervention in the self-reports of participants. Possible suggestions for overcoming this include interviewing participants closer to the end of the intervention, and providing them with a list of all strategies used and intervention components to review before asking for their opinion.

As stated in the *Method* section of this chapter, time and budget of the present thesis allowed for a 6-month timeframe to the study and for three repeated semi-structured interviews during the course of the study. The two main purposes of the Week 16 and Week 24 follow-up interviews were, first, to determine if participants had maintained their PA behaviour, and associated mood changes, in the short-term (Week 16) four weeks after the intervention ended and in the long-term (Week 24) 12 weeks after the intervention ended; and, second, to identify particular strategies and components of the intervention that participants found beneficial Although participants' short- and long-term PA behaviour could be clearly identified, the time interval between these interviews and the end of the LPAC intervention (i.e., 4-and 12-week time intervals respectively) does raise concern about obtaining optimal feedback from participants regarding the particular strategies and components of the LPAC intervention they found beneficial. Perhaps certain lifestyle factors could have changed during the 4- and 12- week time interval, which might have influenced participants' responses. Ideally, conducting an additional follow-up interview in Week 12, immediately following the intervention cessation would have overcome the possibility

of other factors influencing participants' responses. Additionally, participants may have been able to better recall the intervention strategies and components they found particularly useful in assisting with their PA behaviour. Therefore, if time and budget permit, future researchers should consider conducting an additional interview immediately following (i.e., within 2 or 3 days) the intervention cessation. For example, the purpose of this Week 12 interview could be specifically to examine the particular intervention strategies and components participants found useful. The purpose of the remaining two (Week 16 and Week 24) follow-up interviews could then be about determining the impact of the intervention on participants' short- and long-term PA adherence, and any associated mood changes.

It must be acknowledged, however, that in the present study, all participants spoke positively about the LPAC intervention per se, in terms of how it assisted them with their PA intervention, and for some, participation during the intervention and follow-up periods. It may be that the issue of social desirability accounted for participants' reported PA intention and behaviour. That is, they may have just tried to please the researcher delivering the intervention and follow-up assessments. Nevertheless, as previously discussed, some participants identified particular strategies and elements that they found useful in assisting them with the intended PA behaviour. Thus, obtaining feedback from participants in these Week 16 and Week 24 interviews suggests that the present study design would be useful for researchers to consider in future, particularly for researchers examining the impact of an intervention on PA behaviour over time, within specific time and budget restrictions, because it reduces the number of interviews, and the time commitment required from the researchers and participants.

Another design issue emerging from the present study that may raise some concern is the use of the same delivery mode (phone calls) to conduct the intervention support phone calls, and the second and third semi-structured interviews. As mentioned in the *Method* section of this chapter, a telephone delivery mode for the interviews was chosen for participants' convenience. Supporting this design choice was comments made by some participants (particularly those who did not live close to the University, or own a vehicle) indicating that they found it helpful not to have to drive to the University for these sessions. Nevertheless, using the same delivery mode may have confused participants about which phone sessions were a part of the intervention, and which were a part of the data collection. Such confusion, however, seems unlikely. In the initial recruitment phone call, I informed participants that I would be phoning them prior to the intervention commencement to purely obtain information from them about their current PA behaviour and mood. I clearly stated that this baseline interview was not a part of the intervention. Likewise, at the end of the second LPAC support phone call (in Week 12), I clearly stated to participants that this phone call marked the end of the intervention, and that I would be phoning them in 4 weeks time (Week 16), and again in 12 weeks time (Week 24), to obtain their feedback about the intervention, and also to gauge their PA behaviour and mood. Again, I clearly stated to participants that these follow-up calls were not a part of the intervention. Furthermore, all participants said they understood what each session was about, and no participant required further clarification than what I had provided. Thus, to avoid potential confusion for participants concerning the distinction between the intervention components, and data collection, future researchers using a similar study design as the present study should also consider providing participants with clear information at the start of each telephone session to reiterate what the session is about.

Encouragingly, at a group level, there was an overall high (82%) return rate of self-report measures (HADS, SPAQ, PA log) during the study period. Nevertheless, there was inconsistency in return rate of the self-report measures between weeks. For example, in some weeks (e.g., baseline, Week 3 and 6), all participants returned the requested measures, whereas in other weeks (e.g., Week 16, 19, and 23), only four participants returned their measures. Reasons for weekly fluctuations reside in aspects of the study structure. For example, I did not call participants outside of scheduled conversations to remind them about filling in the measures. This was to ensure all participants received the same amount of attention, and to avoid any confusion in the study design or results. A quick phone call however might have prompted participants to complete and return all of the requested measures. Another factor which may have contributed to the inconsistent return rate was requesting measures to be completed and returned during, or surrounding, the weeks when there was a scheduled telephone session (see Figure 5.1). Although I provided support and encouragement for filling in the measures during all conversations, some participants may still have thought that telling me about their PA behaviour and mood in the scheduled telephone conversation was sufficient, especially if they had other commitments that they considered to be of higher priority. Thus, future researchers using self-report measures to monitor PA behaviour over a period time should consider ways to enhance adherence to study measures. Examples include a reminder phone call to participants, 1 or 2 days before the measures are scheduled to be completed; a quick call to participants who have not returned their scheduled measures, for example, within 7 days of scheduled return date, to see if they are having trouble with completing or returning the measures, and answer any questions or queries they may have; or, if time and resources permit, completing measures with participants. Additionally, future researchers conducting qualitative

interviews with participants should consider the timing of requested self-report measures.

Variations between participants in return rate of measures during the 24-week study period was also noted. For example, one participant (Dianne) only returned 8 of the 18 (44%) requested self-report measures, whereas another participant (Kelly) returned all 18 (100%) of the requested measures. One explanation for individual fluctuations in return rate of measures from time to time resides in the individual. In particular, depression level seemed to influence the return of measures for some participants in this study. For example, Dianne acknowledged guilt feelings about her lack of PA participation and she reported elevated depression levels during the study. Both of these factors probably impacted on her poor return rate of the requested measures. On the other hand, Kelly's increased PA motivation and participation, and improved mood during the intervention period, may have positively influenced her 100% return rate of study self-report measures.

Another explanation relates to the delivery mode of the measures. Specifically, some participants may have found it inconvenient to complete the measures by hand, and then return the measures via the post. Consequently, this may have resulted in their lower adherence. Thus, researchers using self-report measures should consider other, perhaps more convenient, ways for participants to receive, complete, and return self-report PA measures (e.g., online). Alternatively, researchers could provide participants with two or three alternative delivery modes, and allowing them to choose the delivery mode that is most convenient for them. Such options could include online, via post (i.e., method used in current study), and face to face (i.e., with researcher).

In the present study, there were two ways of reporting PA: the SPAQ and the PA log. Among some participants (e.g., Lucy, Paula, Mary) who returned the self-report

measures, there were notable differences in the PA amount they recorded in these two self-report PA measures. For example, in Week 12, one participant (Lucy) reported an extra 205 minutes (nearly 3.5 hours) of housework in the SPAQ compared to the total amount she recorded in her PA log for that week. Possible explanations for the disparity in the amount of PA recorded in the two self-report measures include differences in the way the two measures asked for information and differences in the response conditions. With reference to the ways PA was asked about, for example, unlike the SPAQ, the daily PA logs asked participants to record the type and duration of the activities they engaged in that day. There were no specified categories for recording the different types of PA (e.g., sport, active housework, manual labour at work or home, and walking). Although a clear description of the different types of PA was provided on the front page of the PA log, some participants may still have only included their planned (or deliberate) bouts of daily PA, and not their incidental lifestyle PA (e.g., housework). Additionally, with reference to response conditions, if participants completed their self-report measures at the end of the day or week, or at different times (i.e., when both measures were requested in the same week), their reliance on memory to record their daily PA behaviour may have resulted in them not recording the entire amount of incidental PA in which they engaged on one or both of the measures. Therefore, future researchers using two self-report PA measures should consider ways to reduce differences in the recording of PA amount between the two measures. For example, researchers using PA logs could include a statement outlining the different PA types and examples of each, on all daily PA logs, rather than just on the front page of the 7-day PA log. Other examples include encouraging participants to complete the measures immediately following PA bouts, rather than at the end of the day or week, and

contacting the participants to clarify their recorded PA participation, when disparity between recorded PA amounts are noted.

To enhance the likelihood that participants' self-reported PA level reported in their SPAQ and PA log was an accurate reflection of their PA behaviour, and not an underestimate or overestimate (i.e., inflation) of their actual PA behaviour, it was made clear to participants (verbally, and printed at the front of each PA measure) what types and intensities of PA to record in their SPAQ and PA log; and, at the beginning of each phone conversation, participants were asked, whether they were having any trouble or confusion completing the self-report measures. Subsequently, I answered any queries they had. Nevertheless, despite efforts to enhance clarity and support, there was still a notable inflation in the amount of PA some participants reported in their SPAQ responses and the PA log. There was also a discrepancy between the paper-and-pencil self-report measures and the information provided in the interviews. For example, one participant (Paula) reported a weekly total of 0.03 minutes of PA in her Week 8 SPAQ, but in the Week 12 SPAQ, her total weekly self-report PA was 100 minutes. Paula's narratives during these times suggested her PA level typically remained minimal, indicating that the increase in her self-reported PA level from Week 8 to Week 12 might have been due to an artefact. Moreover, another participant (Mary), who reported that she did not work, often recorded the same amount of self-reported PA in the two SPAQ categories labelled "manual labour around the house", and "manual labour at work", which resulted in an inflated self-reported PA amount.

The noted inflation in some participants' self-reported PA may have been partly explained by factors that predispose people to overestimate their PA behaviour, such as communication barriers and social desirability. Examples of possible communication barriers among some participants in this study include a lack of understanding of what

type and intensity of PA to record in the PA log (e.g., one participant continued to report the times she rested on her daily PA logs); and in the SPAQ, a confusion about the category under which to record specific aspects of PA (e.g., manual housework vs. manual labour at work). With reference to social desirability, some participants may have recorded more PA than they actually did, to demonstrate that they were increasing their PA behaviour, which was an obvious aim of the intervention. This noted inflation has also been found in other research utilising the SPAQ **(**Hughes et al., 2002; Rogerson, 2009), including the first study of this thesis (as discussed in Chapter 3, *Methodological Issues* section). Therefore, like all research using self-report measures such as the SPAQ, this issue suggests caution is needed when interpreting participants' PA behaviour and SOC based only on their self-reported data. In future, researchers using self-report measures, such as the SPAQ and PA logs, should consider ways to minimise inflation in participants' self-reported PA. For example, although the SPAQ does include a brief explanation about what to record as PA, the instructions and defined categories may need to be clearer and more detailed to ensure accurate recording. Additionally, as suggested in Chapter 3, the SPAQ may be more effective when researchers administer it in a face-to-face or telephone interview mode. Furthermore, the suggestions for minimising disparity between measures could also assist with minimising inflation of self-reported PA.

In this study, a mixed mode of data collection was used, in which qualitative data was collected in the form of repeated in-depth interviews, and quantitative data was collected through periodic self-report mood and PA measures. No other study has focused on in-depth qualitative methods to examine the effectiveness of a PA consultation intervention in overweight women with T2DM and depression. To my knowledge, only one other study has used a mixture of qualitative interviews and self-

reported measures. That study examined a PA consultation intervention for cardiac patients with depression (Rogerson, 2009). The benefit of including qualitative and quantitative methods, with a focus on the interview material, was that it provided a rich picture of individuals' experiences of participating in the intervention, and associated changes in their PA behaviour and mood during the intervention and follow-up. The interviews also provided me the opportunity to remind participants about completing the study measures, and answer any queries they may have had concerning completing or returning the measures, which may have contributed to the overall high (82%) return rate of self-report measures during the study period. Thus, in future, researchers examining the impact of a psychological intervention on participants PA behaviour and depression over a period of time, should also consider employing qualitative study designs, similar to the one used in the present study, and using a mixture of qualitative and quantitative modes of data collection.

In summary, there were a few issues of concern that arose during this study, which could be addressed in future to strengthen studies. Furthermore, the issues did not have a great influence on the value of this study. In particular, this study has produced some interesting and informative results about the impact of a LPAC intervention on PA participation and mood among overweight women with T2DM and depression, who constitute a high risk population for inactivity. In the next section, I discuss some questions that were raised by this study, for researchers to consider in future.

Future Research

On the outset, to avoid unnecessary confusion, and provide clearer directions for future research, in this section, unless stated otherwise, I use the term "LPAC" when referring to the present study, and the term "PA consultation" when referring to future research.

The optimal intervention for engaging people with depression into PA has yet to be determined (Donaghy, 2007). In particular, it is not clear what are the specific strategies that lead to the most effective intervention for increasing PA and reducing depression in specific populations. Outcomes from the present study have provided valuable insight into the effectiveness of a PA consultation intervention, the LPAC, and associated strategies for increasing PA intention and participation among overweight women with T2DM and depression- a high risk population for inactivity. Specifically, consistent with the proposed strategies identified from Study 2 outcomes (presented in Chapter 4), the PA experiences of participants in the present study suggest facilitating intrinsic motivation and PA self-efficacy should be priorities for assisting with PA behaviour change among overweight women with T2DM and depression. Thus, strategies and components that serve a primary or auxiliary purpose of enhancing intrinsic motivation and self-efficacy seem ideal. For instance, in the present study, during the intervention and follow-up period, participants were more likely to anticipate, begin, and/or sustain their participation in activities they enjoyed (intrinsic motivation), rather than activities that primarily involved extrinsic motivation (e.g., weight loss). Additionally, improved PA self-efficacy (i.e., confidence participants had in their ability to initiate and maintain specific types of PA) appeared to be intricately associated with their improved PA behaviour and associated mood improvements. Therefore, based on present study outcomes, suggested strategies for inclusion in a tailored PA consultation intervention for this population include: educating and encouraging intrinsic (e.g., enjoyment), rather than extrinsic (e.g., weight loss, external reward), reasons for being active; identifying and encouraging activities that individuals enjoy; identifying and overcoming PA barriers; identifying individuals' PA goal/s and ensuring that they are realistic, ideally process-oriented, and broken down into smaller

tasks, thus, enhancing the likelihood of mastery experiences and improved self-efficacy; and getting the individual to devise their own lifestyle PA plan. Additionally, strategies and intervention components that have a particular focus on self-efficacy enhancement, which were beneficial for women in this study, included the addition of two initial consultation support phone calls, verbal support and encouragement, and PA self-monitoring strategies (e.g., SPAQ and PA log). Apart from the present study findings however, little is known about the best ways to engage overweight women with T2DM and depression in PA. Like all qualitative studies, the small sample size of the present study makes it difficult to generalise the outcomes regarding the suitability of the aforementioned intervention components or strategies for increasing PA intention and participation to the broader population of overweight women with T2DM and depression (Bryman, 2008). Moreover, the small sample size of the present study did not permit for any statistical analysis of specific LPAC intervention components or strategies that participants identified as being useful. For example, it may be that some strategies (e.g., goal setting) were more effective than others (e.g., identifying sources of social support) in assisting overweight women with T2DM and depression to initiate and maintain regular PA. Thus, to build on the positive aspects of the current study and continue identifying appropriate and effective ways to engage overweight women with T2DM and depression, further research with larger sample sizes is needed to separately evaluate the effectiveness of the PA consultation intervention strategies and techniques used in this study, particularly in terms of the extent to which each strategy or technique independently and in combination enhances PA intention and participation in this population. Furthermore, it may be that additional strategies/techniques should be included, such as a group exercise class or work out session. Perhaps these classes can be an option additional to a psychological intervention, particularly for women who

require additional social support (e.g., those with higher levels of depression) and assistance with increasing and sustaining their PA behaviour.

To reiterate, PA consultation has been successfully utilised as an intervention to increase PA in people with other chronic illnesses, such as CHD (e.g., Hughes et al., 2007; Rogerson, 2009). To my knowledge however, apart from the present study, and that of Rogerson (2009) who used a similar PA consultation intervention design for increasing PA among cardiac patients with depression, PA consultation (based on guidelines put forth by Kirk et al., 2007 and Loughlan & Mutrie, 1995) has not been examined in any depth with depressed individuals. Therefore, if, in future, researchers can explore in detail the most appropriate strategies to incorporate into a PA consultation, then it would also prove valuable to learn more about the most effective way to structure the intervention. Specific questions for consideration include the most effective frequency and location within the intervention of face-to-face consultation and support phone calls for promoting PA participation and adherence. Also, studies should examine whether the structure of the consultation and phone calls should take into account individuals' specific conditions or situations, or whether the same structure is equally appropriate for all participants. In previous studies, such as those conducted by Hughes et al. (2007) and Kirk et al. (2004), researchers found that PA consultations and associated telephone follow-up sessions conducted over 9 months were successful at increasing PA. As previously described, both Hughes et al. and Kirk et al. included an extra face-to-face consultation and follow-up phone calls, which were delivered over a longer period of time, compared to the current study. Participants in the current study were happy with the structure of the intervention, and in particular, the support and encouragement provided in the 12-week intervention period. However, it should be noted that this was their first and only experience of PA consultation, during which they

were paid much greater attention than with usual care, so it is not surprising that their reaction to the intervention was generally positive. Nevertheless, as mentioned, those women with a high level of depression did not act upon their intention to increase their PA behaviour for most of the intervention and follow-up period. Therefore, some participants, such as those with a moderate to severe level of depression and/or a low level of PA at baseline may benefit more from additional face-to-face consultations, and some may require more regular consultation support phone calls, such as every fortnight for the first 12 weeks (consistent with Rogerson's 2009 study design), but then perhaps the frequency can be reduced, for example, to monthly for the next 3 months. This more intense intervention design would also provide additional social support for these individuals. Other participants however, such as those with lower levels of depression, and those who indicate a greater level of readiness to initiate PA, may not need further consultations until 5 or 6 months, and may require less frequent support phone calls, which cease earlier. These are all questions that would benefit from examination in research to delineate the most effective PA counselling for various populations, such as those with multiple chronic conditions, including depression.

With respect to intervention duration, future researchers should explore how long interventions should be in order to achieve the desired increase or maintenance of PA. For example, all women in the present study were intending to either act upon, or progress with their increased PA participation beyond the follow-up period (i.e., 24 weeks after the initial LPAC). Whether or not they acted upon their intention is unknown. Kirk et al. (2004) reported that PA adherence for people with T2DM can be sustained for 12 months after PA consultation. On the other hand, in the general population, Lowther et al. (2007) found that PA adherence decreased substantially approximately three months after participation in a PA intervention. Dorn et al. (2001)

also found a short-term drop off in PA in people with cardiac conditions after they participated in a cardiac rehabilitation intervention program. Additionally, researchers have suggested that the crucial period for long-term maintenance of PA is between 6 and 12 months, that is, when participants sustain their intervention level of PA for this length of time they tend to continue being active in the long term (Jackson et al., 2007; Lowther et al., 2002, Lowther et al., 2007). The design of the current study allowed for a 3 month intervention, followed by a 3 month follow-up period. Time constraints prevented me from further extending the length of either the intervention or follow-up. Thus, research is needed to determine both the ideal length for PA consultation interventions to encourage overweight women with T2DM and depression to initiate PA, and a follow-up period that is long enough to determine whether long-term PA adherence is achieved.

Researchers who conduct PA consultation interventions should also include detailed economic evaluations or cost-benefit analyses to determine the feasibility and possible economic benefits of the intervention (King et al., 1998; Roux et al., 2008). An advantage of PA consultation interventions is the relatively low financial costs involved, with no expensive equipment required to run the intervention (that is, if objective measures of PA and/or diabetes control are not used). Nevertheless, typical PA consultation interventions do rely on available time and labour resources to conduct the consultations and follow-up support phone calls. Thus, PA consultation interventions with different intensities (e.g., one versus two face-to-face consultations, and two or more follow-up phone calls) and durations (e.g., 3 month versus 6 month intervention duration) require varying amounts of time and labour commitment. Cost-benefit analysis of more and less intensive interventions (and thus extra labour involvement) in relation to the extent of enhancement of PA intention, participation, and

adherence, however, may show that the extra time and labour outlay does not lead to equally greater returns in terms of additional PA. For example, perhaps a less intense 3 month intervention design (such as the one used in the present study) achieves similar outcomes in terms of enhancing PA participation and adherence compared to a more intensive intervention design (e.g., such as Rogerson's study design), yet with less time or labour needed. The similar outcomes obtained from this study compared to outcomes from Rogerson's intervention suggest this is a possibility. Specifically, in Rogerson's study, although not statistically significant, participants' mean self-reported PA level and SOC increased over the course of the intervention, but decreased from Week 10 to Week 24 (post-intervention). Additionally, similar to the present study finding, in Rogerson's study, participants with depression at baseline were more likely to have lower PA levels, and perceive themselves to be less active compared to people who were not depressed at baseline, at all time points throughout the study (Rogerson, 2009). Thus, economic evaluations and cost-benefit analysis of varied PA intervention intensities and durations will provide valuable information on the suitability of PA consultations, particularly in contexts such as health care settings (e.g., diabetes clinics) with limited resources (e.g., staff, time, and money).

In terms of effective PA measures to be used in PA consultation interventions, future research could explore the value of using alternate ways to measure PA, such as objective devices like pedometers. Additionally, pedometers have been shown to act as an effective technique to increase PA maintenance (Croteau, Richeson, Famer, & Jones, 2007). Therefore, another interesting topic for researchers is to determine the impact, which has been observed, but not really quantified, of pedometers on participants' motivation. In the present study, all women indicated improvement in their psychological readiness to be active, Additionally, although all women reported

intentions to increase their PA behaviour, and most women reported progress in their *actual* PA behaviour during the study period, women with moderate to severe levels of depression did not act upon their PA intention for the majority of the study period. Perhaps the inclusion of pedometers could help to increase participants' motivation to engage in PA in two ways: simply giving participants a pedometer to use could encourage them to do more PA; and asking participants to check their pedometer readings periodically could give them positive feedback that will enhance motivation. Thus, research should be developed to examine these effects. Knowledge gained from such research would be valuable in identifying effective ways to enhance PA participation among overweight women with T2DM and depression.

Including objective measures of diabetes control, such as glycaemic control, would provide valuable information on the impact of PA consultation interventions on participants' diabetes management. Previous research examining PA consultation in people with T2DM (e.g., Kirk et al., 2004) has included physiological markers of diabetes control (e.g., glycaemic control), as well as blood pressure and lipid profile. According to the RCT results in the study by Kirk et al., the intervention group recorded significant improvement in PA levels and the physiological markers at 6 and 12 months post-PA consultation. Present study outcomes suggest that the PA consultation intervention could have a positive impact on physiological markers of diabetes control by prompting women to regularly monitor their blood glucose level, and via increased PA participation. Although likely, this proposition remains speculative. In particular, two questions that are worthy of future research involve determining if low intensity PA (e.g., housework, walking) and small PA bouts (e.g., lower than the minimum amount recommended to achieve health benefits; Pate et al., 1995), can provide some positive impact on women's diabetes prognosis. To date, sparse research evidence exploring

these questions exists. Encouraging outcomes from a study by Healy et al. (2007), which involved men (n = 67) and women (n = 106) without diagnosed diabetes, suggest a dose-response relationship between sedentary behaviour and moderate to vigorous intensity PA with 2-hour plasma glucose (a marker of glucose control). Furthermore, their study outcomes revealed that light-intensity PA was significantly, and independently, associated with 2-hour plasma glucose (Healy et al., 2007). Whether the same beneficial impact of low intensity PA, (and at small doses, which was not examined in the Healy et al. study), on diabetes control applies to overweight women with T2DM and depression however is unknown. As demonstrated in the present study, these women may find it difficult, at least initially, to achieve 30 minutes of moderate-intensity exercise. Therefore, information about the impact of low intensity PA, and small PA bouts on the diabetes prognosis of women in this population would be valuable for researchers, health professionals, and overweight women with T2DM and depression, alike.

Summary

This intervention study involved six overweight women with T2DM and depression. The purpose was to explore their individual perceptions of undertaking a 12-week psychological intervention, labelled the LPAC intervention, and any resultant changes in their PA behaviour and mood (particularly depression level) during the intervention and 12-week follow-up period. A positive finding from interviews at Week 16 and Week 24 was that all women found the LPAC intervention beneficial for increasing their psychological readiness for participation in PA (e.g., their awareness, motivation, and intention), and most participants increased their actual participation in PA. Corresponding with participants' narratives regarding increased readiness for PA behaviour were their self-report SOC. Specifically, all participants reported progress in

their SOC during the intervention period, which they had either maintained or continued to progress with their SOC during the follow-up period. To my knowledge, this was the first study to examine the influence of a tailored PA consultation intervention for overweight women with T2DM and depression. Study outcomes suggest the intervention was particularly useful is assisting with increasing PA for women who were contemplating or preparing to increase their PA. However, it did appear that women experiencing a moderate to severe level of depression may require additional assistance with increasing their actual PA participation. Specifically, in the Week 24 interview (marking the end of the follow-up period), three participants (Kelly, Lucy, and Mary) reported a sustained increase in their self-reported PA behaviour and expressed enthusiasm at continuing to be active. One woman (Clare) had initially increased her PA, but worsened health status had prevented her from sustaining her increased PA level at Week 24. Nevertheless, her psychological readiness, in particular, her optimism to continue with her PA behaviour (once her health status improved) beyond the follow-up period was evident. Two participants (Dianne and Paula) remained relatively sedentary throughout the follow-up period. They both acknowledged that the intervention was beneficial in increasing their awareness of the need to be physically active, but it appeared that their high levels of depression hindered their PA participation.

Overall, an inverse reciprocal relationship between PA and mood was evident in all participants and to varying degrees during the intervention and follow-up period. Women who remained relatively inactive (Dianne and Paula) were more likely to report a reciprocal relationship between low mood (high depression) and low PA; whereas women who had increased their PA behaviour more often spoke about the positive influence of their PA behaviour on their mood, which facilitated further participation. Strategies that were

identified as being particularly useful in assisting participants with their PA behaviour were those that directly and indirectly facilitated participants' intrinsic motivation and PA self-efficacy. Therefore, these findings provide support for theory-based interventions and strategies for assisting overweight women with T2DM and depression with successful behaviour change. In particular, PA consultation is based on principles and processes that are derived from Bandura's (1986) self-determination theory, Prochaska and DiClemente's (1982) transtheoretical model, and Deci and Ryan's (1985) self-determination theory. The impact of PA consultation on self-efficacy through use of mastery goals, on stage of change based strategies for behaviour change, and on providing experience of autonomy, perceived competence, and social relatedness were all evident in the course of this study. These findings are particularly relevant for health professionals aiming to increase PA and enhance mood in overweight women with T2DM and depression. The information should also be helpful for researchers aiming to examine the design of effective and appropriate psychological interventions for overweight women with T2DM and depression. The promising results of the current study highlight particular directions for future research on interventions to increase PA among this population. These directions include evaluating the effectiveness of individual strategies and intervention components; exploring effective ways to structure the intervention; examining the ideal intervention duration for assisting participants with increasing or maintaining PA participation; including economic evaluation and cost-benefit analysis when conducting intervention studies; and including objective tools for monitoring PA for increasing PA participation and adherence, and objective measures of diabetes control. Furthermore, the value of qualitative research, in particular, for testing the effectiveness of interventions was highlighted in the present study. Previous researchers have shown PA consultation to be effective in increasing PA participation among various populations. In such research, quantitative methods,

particularly a RCT design, have predominantly been used. The RCT is considered to be the strongest design for testing whether interventions are successful. The qualitative nature of the present study, however, allowed me to gain a rich understanding of individuals' experiences of participating in the intervention, and to explore associated changes in their PA behaviour and mood. Therefore, considering the different benefits associated with quantitative and qualitative research, in future, researchers examining the effectiveness of interventions should consider using a variety of research methods. In concluding, given the high risk of inactivity among overweight women with T2DM and depression, and the negative influence of depression on PA participation, the present study outcomes should contribute to health professionals' and researchers' understanding of how to promote PA and enhance mood (particularly decrease depression) among overweight women with T2DM and depression.

Chapter 6: General Discussion

The overall aim of this thesis was to investigate the relationship between PA and depression in overweight women with T2DM. To achieve this, I conducted three linked studies. In Study 1, I examined the relationship between PA and depression in overweight women with T2DM, using questionnaires to measure PA and depression. In Study 2, I explored the PA barriers and facilitators for overweight women with T2DM and depression, using in-depth interviews. Finally, in Study 3, I designed and implemented a psychological intervention aimed at increasing PA participation and adherence for overweight women with T2DM and depression, examining participants' experiences related to PA and their reports of associated changes in depression. Study 1 outcomes indicated no significant relationship between overall leisure-based PA and depression. There was however a significant relationship for active housework (a sub-type of leisure PA). This finding suggested that among overweight women with T2DM, those with higher depression levels were less likely to engage in active housework. With reference to participants' perceived activity level (according to the transtheoretical model) there was no significant difference in depression between those who claimed to be regularly active and those who were in a non-active stage of change (SOC). From Study 2, I learned about the factors which influence participation in PA for overweight women with T2DM and depression. Some of the common barriers reported by participants included functional limitations of daily living, depression, and low exercise priority, while the facilitators that encouraged PA participation included physical, physiological, and/or psychological health improvement, instrumental facilitators to PA, and having positive social support and encouragement.

The information gained from Study 1 and Study 2 highlighted the issues and problems associated with having depressive symptoms, and potential physical

movement limitations in terms of beginning and/or maintaining regular PA participation. Previous research has demonstrated the effectiveness of exercise/PA consultation (developed by Loughlan and Mutrie, 1995) for assisting with promoting PA participation and adherence. Such findings from previous research substantiated my conviction regarding the suitability of a PA consultation intervention for overweight women with T2DM and depression.

Thus, with this combined knowledge, in Study 3, I designed and conducted a 12-week psychological intervention, labelled "lifestyle physical activity consultation (LPAC) intervention", specifically designed to suit overweight women with T2DM and depression. The intervention was based on the PA consultation guidelines put forth by Kirk et al. (2007) and Loughlan and Mutrie (1995). Individual and shared experiences of the six women who took part in the LPAC intervention revealed several noteworthy findings, including:

- The LPAC was effective for increasing all participants' psychological readiness (e.g., motivation and intention) for PA participation;
- The LPAC intervention was effective for increasing some participants' actual PA participation;
- Women who increased their PA participation (even by a small amount), reported an associated improvement in their mood, particularly reduced level of depression; and
- Women who had a moderate to severe level of depression during the 12-week LPAC intervention and 12-week follow-up were more likely to report lower PA levels during this 24-week period, than women with lower levels of depression.

In the remainder of this chapter, I discuss some of the main findings from the present thesis. I also link the three studies together, and discuss how they interrelate. Additionally, I consider the importance and relevance of each finding in the context of research in the area of PA and depression, especially for people with chronic conditions, and I identify possible areas for future research attention. Following this, I address the implications of the present thesis findings for health professionals working with overweight women with T2DM, such as diabetes specialists, weight loss/maintenance specialists, psychologists, general practitioners, exercise professionals, as well as family members and friends of this population. Moreover, in light of the widespread problem of inactivity and depression, I highlight the relevance of the present thesis findings to other populations.

Prevalence and Severity of Depression in Overweight Women with Type 2 Diabetes Mellitus

One of the most noteworthy findings from the current research was the prevalence and severity of depression in overweight women with T2DM. For example, in Study 1, 83.6% of participants reported at least mild depression (HADS-D score ≥ 8), with 44.3% of these women experiencing a severe level of depression (HADS-D score ≥ 15). Similarly, previous research has consistently found a high prevalence of depression in women with T2DM (Collins, Cocorant, & Perry, 2009; Roupa et al., 2009; Sotiropolous et al., 2008) and/or women who are overweight (Heo et al., 2006; Tuthill, Slawik, O'Rahilly, & Finer, 2006). The incidence of mild and severe depression in Study 1, however, was substantially greater than that found in previous research. In particular, this was evident compared to the study by Roupa et al., which also used the HADS (HADS-D score ≥ 8) to assess depression in women with T2DM. In their sample, 41.4% of women reported mild depression (Roupa et al., 2009). The

particularly high prevalence of severe depression in women in Study 1 in this thesis is also highlighted when compared to study by Collins et al. that used the same HADS-D cut off (score ≥ 15) to categorise severe depression. In their sample of women with T2DM, 2.1% reported severe depression, which is considerably lower than that reported in the sample in Study 1 of the present thesis. One of the reasons for this stark discrepancy could be that, a BMI of 25 or more (indicative of at least overweight; WHO, 2010) was not an inclusion criterion for participation in the studies of Roupa et al. and Collins et al., whereas it was an inclusion criterion in the current study. In their sample of women, Roupa et al. did find that there was a 4% increase in depression risk for every one unit increase in BMI. Thus, considering the prevalence and risk of depression is greater for females compared to males, people who are overweight or obese compared to normal weight individuals, and people experiencing a chronic health problem (e.g., T2DM, CHD) compared to those who are not (AIHW, 2010; WHO, 2010), a likely explanation for the high prevalence of depression across the symptom severity among participants in Study 1 of this thesis is the combination of all three depression risk factors: female gender, overweight or obesity, and T2DM. Moreover, most women in the Study 1 reported at least one other health complication. Previous research findings suggest for people with T2DM, increased depression is likely associated with the presence of complications, rather than diabetes diagnoses per se (De Groot et al., 2001; Engum, Mykletun, Midthjell, Holen, & Dahl, 2005; Lloyd, Dyert, & Barnett, 2000). Therefore, the presence of additional health problems among participants probably further contributed to the substantial proportion of women reporting mild to severe depression. This is problematic because there is a strong association between overweight and T2DM, and the risk of diabetes and non-diabetes related health complications are increased for people experiencing this combination of

conditions (WHO, 2009). It is probable the levels of depression obtained in the current study were an accurate reflection, perhaps even an underestimate, of the overall population prevalence of depression among overweight women with T2DM. It is possible that the extent of depression in this sample is an underestimate of the prevalence of depression in overweight women with T2DM for a number of reasons, including the following: Participants were required to complete and return the questionnaire in their own time and it is likely the more severely depressed individuals did not take part in this process because of the lethargy and apathy associated with depression. Return rates are notoriously low for questionnaire research (Hansen & Hurwitz, 2004). This is underscored by Study 1 in the present thesis. In this study, the final return rate of completed questionnaire packs was 7.85% (77/981). Depressive symptoms (e.g., lethargy, diminished ability to concentrate) may have resulted in disinterest regarding filling in and/or returning completed questionnaire packs among women who were depressed. Thus, research is still needed to find ways to accurately estimate true depression prevalence and severity in overweight women with T2DM. Nonetheless, the incidence and severity of depression in the sample in Study 1 raises concerns about the most appropriate kinds of support for overweight women with T2DM, especially when they have additional complications.

The recruitment issues associated with the first study also highlight the difficulty of conducting research in this population. This issue was discussed in Chapter 3. Nevertheless, it can be very difficult to recruit people with multiple health conditions (e.g., overweight, T2DM, and depression) into studies about their thoughts, feelings, and behaviour, particularly in studies (like the first study of this thesis) which do not involve direct contact with the researcher during recruitment. Given the adverse impact

of depression on health and diabetes management, determining a way to recruit truly representative samples of overweight women with T2DM for research is a critical issue.

The problematic nature of depression for people with T2DM has been shown in previous research, which demonstrates that depression lowers glycaemic control (Lawrence et al., 2006), enhances the progression and severity of diabetic complications (Lin et al., 2010), increases risk of morbidity and mortality (Williams, Clouse, & Lustman, 2006), decreases quality of life (Maddigan et al., 2006), and increases functional and work disability (Ryerson et al., 2003; Von Korff et al., 2005). In addition, depression is associated with poor adherence to diabetes treatment regimens (McCollum et al., 2007), including regular PA (Piette, Richardson, & Valenstein, 2004).

The high prevalence of depression for overweight women with T2DM, and potential problems associated with depression raise question about whether ongoing assessments of depression by healthcare professionals should be essential for effective diabetes management. Evidence to date indicates depression assessment should be a necessary part of diabetes management. Further research should aim to determine the most effective and feasible ways to carry out such assessments. Issues that could be addressed include, how often depression assessment would be required for each person with diabetes, and what depression assessment tools would be most effective to use with this population. For example, because of the potential influence of diabetes-related symptoms confounding actual depression, self-report measures, such as the Hospital Anxiety and Depression Scale (HADS), which specifically omits physical symptoms of depression, seem advisable. The HADS is a well-validated and reliable measure, particularly for identifying people with at least a mild level of depression. Nevertheless, as discussed in Chapter 3 of the present thesis, more research is needed to determine the most appropriate HADS depression subscale threshold value for identifying a severe

level of depression, which has not yet been resolved. To date, researchers who have used the HADS to identify severe depression have used a cut-off point of 15 (Cameron et al. 2008) or 16 (Tuthill et al., 2006). In the current thesis, the high prevalence of severe depression among participants in Study 1 was evident regardless of whether a cut-off of 15 (44.3%) or 16 (32.8%) was used. Clearly the threshold value used influences the resulting prevalence rate, and may have repercussions in practical settings which use depression measure scores as part of their referral system to identify people in need of further mental health services. Thus, because of the lack of certainty about the most appropriate HADS depression sub-scale threshold value for identifying severe cases of depression, and the high prevalence of severe depression identified in Study 1, research and practice would benefit from further clarification of the severe depression cut-off on the HADS.

Physical Activity and Depression among Overweight Women with Type 2 Diabetes Mellitus

One of the main findings to emerge from all three studies of the current thesis was the negative relationship between depression and participation in leisure-based PA, particularly lifestyle PA, among overweight women with T2DM. As mentioned, in Study 1, I found a negative trend between depression and leisure-based PA, and a significant negative relationship between depression and active housework. The negative impact of depression on PA, particularly active housework, is concerning. In all three studies of the current thesis, participants reported lifestyle-related PA (e.g., active housework and walking) to be their main mode of PA. Previous research also suggests lifestyle PA to be a preferred PA mode for sedentary individuals, people who are overweight (Andersen et al., 1999), individuals with T2DM (Kirk et al., 2007) and

people with depression (Richardson et al., 2005), when they consider increasing PA participation

Participants from Study 2 also indicated depression (or low mood) was a major barrier preventing them from being able to initiate or maintain regular PA. They reported that when they were "feeling low", they were more likely to choose a sedentary activity (e.g., stay in bed, read a book, watch TV), rather than engage in PA. A number of participants had experienced depression for at least six months prior to taking part in the study. Some even reported experiencing depression on and off for most of their life. As well as being considered an independent PA barrier, Study 2 outcomes also revealed depression to be clearly associated with a number of other reported barriers, such as physical/physiological health limitations (e.g., body weight, low energy, and tiredness), low self-efficacy, and lack of social support. Perhaps, for overweight women with T2DM who have a high probability of reporting physical limitations (e.g., associated with their weight and/or T2DM), regardless of whether or not they are still able to carry out the activity, experiencing elevated depression may reduce their *perceived* ability to carry out physical tasks. Thus *actual* participation might decline, including in daily life activities, such as housework. Indeed, experiencing physical and psychological health problems- a likely scenario for overweight women with T2DM and depression- makes PA participation extremely difficult. As reported with reference to Study 1 and Study 2 outcomes, in conducting the LPAC intervention (Study 3), participants' experiences over the 24-week study period suggest low mood (particularly depression) and self-reported PA were negatively associated. The qualitative mode of analysis, which allowed for in-depth insight into participants' experiences in undertaking the intervention, makes this finding all the more noteworthy. Specifically, among those who took part in the 12-week intervention, the two participants who reported a higher level

of depression at baseline were less likely to be physically active, in all types of daily activity, for the duration of the intervention and the follow-up period. To some extent, the negative relationship between depression and PA among overweight women with T2DM, observed in all three studies of the current thesis, is not surprising. As mentioned, previous research outcomes have typically indicated a high depression risk for women, people who are overweight, and individuals with chronic health problems like T2DM. Moreover, the negative influence of depression on adherence to regular PA in people with T2DM has been well documented (Koopmans et al., 2009; Lin et al., 2004; Lysy et al., 2008),

On a positive note, participants in Study 2 commented that when they did engage in PA, they felt “better”, “good”, and less stressed. These experienced psychological benefits, in turn, facilitated further PA participation. Also, the anticipated physical (e.g., weight loss, lessened arthritic pain), physiological (e.g., increased fitness and energy) and psychological benefits of PA acted as facilitators to PA participation. Additionally, an encouraging outcome from Study 3 was that after taking part in the LPAC intervention, all women expressed an increase in their psychological readiness for PA (e.g., increased PA motivation and intention). This is a noteworthy finding. Previous research findings suggest that programs that focus on improving motivational readiness for PA and enhancing self-efficacy are critically important for assisting overweight women with their PA behaviour (Delahanty et al., 2006). Moreover, helping people to progress even one stage higher on the SOC model (also referred to as the transtheoretical model) has been shown to double their chance of successful action on the target behaviour in the near future (DiClemente et al., 1991). Therefore, although women experiencing a high level of depression in the present study did not act on their PA intentions during the study period, taking part in the LPAC intervention did seem to

have a positive impact on their readiness. The finding that women experiencing a high level of depression did not act on their intention to engage in PA also suggests that more is needed than the LPAC intervention alone, to assist overweight women with T2DM, who are experiencing a high level of depression, to increase their actual PA behaviour. Possible suggestions for future researchers to consider are provided in a later section of this chapter.

Also, women who took part in the LPAC intervention, who did increase their actual participation over time, even by small amounts, reported an associated improvement in their mood, including reduced depression. They also claimed that these mood benefits, in turn, facilitated their future PA participation. Thus, for some women, the LPAC intervention seemed to have been effective in increasing self-reported PA participation and associated mood (including decreasing depression). Moreover, although women who reported an increase in their actual participation still reported physical restrictions (e.g., arthritic pain), they found other ways to be active (e.g., water-based PAs), instead of perceiving their physical restrictions as fully disabling (and thus, as FL). For these women, it may be that experiencing PA-related mood benefits, including enhanced self-efficacy, helped to increase their perceived ability, regardless of their physical restrictions. Alternatively, or in conjunction, it may be that taking part in the LPAC intervention helped them to think about their ability to engage in PA, despite their physical restrictions, for example, by recognising and overcoming PA barriers, and considering different PA options. Regardless of the underlying reason, the finding that these women increased their PA participation, despite reporting physical restrictions is encouraging, because outcomes from all three studies highlight the high risk of physical limitations for overweight women with T2DM and depression. For example, most participants in Study 1 reported on their demographic form, the presence of at least one

other health problem in addition to T2DM, and physical restrictions was also a PA barrier that was commonly expressed in Study 2 and Study 3. Thus, enhancing perceived ability (e.g., despite physical restrictions) and desire to be active may be important for assisting overweight women with T2DM and depression to increase or maintain their PA participation. Clearly, the PA experiences of participants who took part in the LPAC intervention highlight the importance of a tailored psychological intervention for enhancing psychological readiness and actual PA participation among overweight women with T2DM and depression- a high risk population for inactivity.

Another important finding of the current thesis was that most women in Study 2 indicated well-being benefits from PA, even at amounts lower than that recommended for physical health benefits (Pate et al., 1995); a finding that was also noted in Study 3. For populations with depression, and/or who may not, at least initially, be able to engage in an amount of PA to obtain physical health benefits (e.g., due to physical and/or physiological health limitations), encouraging even small amounts of PA is crucial, particularly for experiencing psychological benefits, which may in turn, facilitate PA participation, and gradual increases in the amount of PA undertaken. Thus, not only does this highlight the importance of the current research, but also the need for further research investigating the nature of the reciprocal relationship between PA and depression in overweight women with T2DM, in particular, longitudinal research using a larger sample size, examining this relationship overtime. For example, all women in Study 3 expressed an intention to either begin or continue progressing with their PA behaviour. Those who were active at the end of the 12-week follow-up period expressed an associated improvement in their mood. Whether or not they continued to progress with their PA and experience the desired psychological benefits is unknown. Information from longitudinal research would help to identify the most effective times

to deliver interventions to increase PA adherence, particularly among those with high levels of depression. Also, such research would provide insight about the times when women might be at higher risk of inactivity due to depressive symptoms, and thus when additional assistance and support may be required to assist these women to facilitate or continue their PA participation. Knowledge gained would provide useful information to assist health professionals (e.g., diabetes specialists, exercise professionals, and weight loss specialists) in terms of designing and delivering psychological interventions aimed at promoting PA participation and adherence for overweight women with T2DM.

Contemporary researchers in the field of sport and exercise psychology have recognised that including a variety of quantitative and qualitative methods, enhances, rather than hinders, the quality and credibility of knowledge gained (Biddle, 2001; Munroe-Chandler, 2005). The quantitative (Study 1) and qualitative (Study 2 and Study 3) nature of the present thesis demonstrates the value of this. Moreover, as well as contributing to existing research knowledge, outcomes from all three studies highlight certain areas for further quantitative and qualitative research to explore, particularly concerning PA and depression. For example, in Study 1, factors that may have increased participants' depression risk included low socio-economic status and presence of diabetes-related health problems. Thus, further research is warranted to explore these and other potential factors influencing the presence of depression for overweight women with T2DM. Furthermore, to ensure samples in future studies are accurate reflections of the wider population of overweight women with T2DM, researchers should also consider recruiting participants from a variety of sources (e.g., independent diabetes clinics in two or more locations). Information from such research would assist with the development and implementation of psychological interventions aimed at increasing PA and reducing depression in this population. Outcomes from Study 2 and

Study 3 also provide direction for further qualitative enquiry. For example, participants in Study 2 talked about the positive influence that their diabetes specialists had on their PA behaviour. Similarly, in Study 3, most women indicated they valued the support and encouragement I provided in my role as counsellor (delivering the LPAC intervention) in their attempts to increase PA. Participants in Study 3 may have viewed that counselling support as a health professional assisting them with their PA behaviour. These outcomes coincide with previous research findings that older populations (Booth et al., 1997; Schutzer & Graves, 2004) and people with depression (Faulkner & Biddle, 2004) value the PA advice they receive from their health practitioner. Thus, an interesting topic for future qualitative researchers is to explore the effectiveness of PA advice provided by diabetes specialists. Such information would benefit research and practice alike. For example, in health care settings, the outcomes would assist with enhancing the delivery and effectiveness of interventions aiming to promote PA participation among overweight women with T2DM and depression. Knowledge gained from quantitative and qualitative research addressing these issues will continue to aid our understanding of these important public health issues, particularly among this population.

To summarise, findings from all three studies of the present thesis demonstrate that overweight women with T2DM are a high-risk population for depression and physical inactivity. Moreover, outcomes also highlight the negative impact of depression on PA participation, including lifestyle activities, such as active housework. This is a critical concern, because lifestyle PA is a commonly reported PA mode among this population, and PA plays a key role in the management of diabetes, weight, and psychological health. Fortunately however, outcomes from this thesis (e.g., Study 2 and Study 3) also demonstrate that for overweight women with T2DM and depression,

participating in PA; even at levels below the minimum recommended for physical health benefits, can lead to experienced psychological benefits, including reduced depression. Importantly, such psychological benefits can then facilitate their further PA participation. It is not possible to make general conclusions about the benefit of a tailored PA consultation intervention for overweight, T2DM women with depression for initiating and maintaining involvement in PA. Nevertheless all six women in Study 3 showed increased readiness to undertake PA, suggesting that PA consultation has the potential to at least prepare women in this population for PA, and might in some cases stimulate them to increase participation. These findings are promising, and provide the first insight into both the problem and a possible solution, for increasing PA among overweight women with T2DM. Nevertheless, further intervention research is needed to continue uncovering effective ways of promoting PA participation and adherence among overweight women with T2DM, particularly those experiencing a high level of depression. Thus, in light of Study 3 outcomes, in the next section, I provide several directions for intervention researchers to consider.

Exploring Effective Ways of Increasing Physical Activity and Reducing Depression among Overweight Women with Type 2 Diabetes Mellitus

Apart from the LPAC intervention and strategies that were found to be beneficial for the six women who took part in the intervention study (detailed in Chapter 5 of the present thesis), there may also be other types of adherence interventions or psychological strategies that are effective for increasing PA in overweight women with T2DM and depression, particularly those experiencing a moderate to severe level of depression. For example, in the intervention study, two women (Paula and Dianne) who were experiencing a moderate to severe depression level did not act upon (or at least sustain) their increased PA awareness, motivation, and

intention. Therefore, for overweight women with T2DM and moderate to severe depression, a PA consultation intervention could be used in conjunction with psychotherapy to increase PA level and enhance womens' overall mood and psychological well-being.

Intervention duration is another important issue for researchers to consider. This issue was discussed in Chapter 5 of the present thesis. Nonetheless, it is an issue that again deserves acknowledgement. In particular, a valuable direction for future researchers would be to investigate the impact of interventions with varying durations. For example, the two women experiencing a high level of depression who did not act upon their PA intentions during the study period may have benefited from a longer (i.e., than the 12-week LPAC) intervention duration. On the other hand, for women who experienced a lower level of depression who increased their actual PA earlier during the intervention period and maintained their increased PA during the rest of the intervention period and the 12-week follow-up period, a shorter intervention duration may have been sufficient.

In addition to investigating the most effective types of interventions and intervention durations for overweight women with depression, further research could be designed to examine the effects of different characteristics of interventions on PA adherence and depression levels. Specific research questions that could be addressed include whether people would benefit more, in terms of increasing PA and decreasing depression, if interventions were conducted in groups, rather than individually, and whether the setting of an intervention (e.g., in the home, community, or a health care setting) influences the effectiveness of the intervention. Previous research outcomes have shown group-based psychological PA consultations to be effective for increasing PA participation, including among people who are obese (Schelling, Munsch, Meyer,

Newark, Bierder, & Margraf, 2009). Additionally, community-based interventions have been shown to be effective for increasing PA participation in the adult population (Kahn et al., 2002). Outcomes from the intervention study of the current thesis suggest overweight women with T2DM and moderate to severe levels of depression may benefit from the additional opportunity for social support provided from a group-based psychological intervention. For example, the two participants (Dianne and Paula) who experienced a high level of depression both said they would have benefited from additional support with their PA behaviour. A comment from Dianne which reflected this was: "I don't know if I had done it with somebody, if it would have been more useful…if I was paired up with somebody else that was doing that activity or an activity that you could participate in…I think I would respond to that more". This corresponds with the conclusions from a study by Craft, Perna, Freund, and Culpepper (2008) that women with depression in their sample were unlikely to seek social support for their PA behaviour. Findings from Study 2 of the current thesis provide further support for the potential of a group based PA consultation for overweight women with T2DM and depression. Specifically, some participants reported that exercise in group settings that provide support and encouragement facilitated their PA behaviour. Therefore, a particular question for researchers examining the effectiveness of group-based PA interventions to consider is whether women who require additional support, such as those experiencing high levels of depression, benefit more from a group-based PA consultation An additional question for researchers to consider is whether different delivery modes (e.g., phone vs. face-to-face) influence the effectiveness of interventions aimed at increasing PA and enhancing mood (e.g., decreasing depressive symptoms). Findings from the intervention study in this thesis suggest some women may prefer to receive a phone consultation, for convenience. To examine the particular effects of

different characteristics of interventions (e.g., an individual-based intervention, either conducted face-to-face or via the telephone, or a group-based intervention, for example, run by the local community health care centre or diabetes clinic) on PA adherence and depression levels, researchers should consider exploratory studies like Study 3 of the present thesis. The advantage of this type of research is that it provides insights into the particular intervention characteristics, which in turn, generate ideas that can then be examined by controlled studies, such as RCT or other types of comparison studies. Oldridge (1988) highlighted the importance of RCT designs to determine the full effects of interventions. An example of a RCT that researchers could conduct is one that varied these aspects (face-to-face, phone, group) between conditions, to see which aspect (or combination) is most effective. Another example of a possible RCT is to compare a condition in which individuals choose their own style of intervention (e.g., individual or group) with one in which the intervention is set. Outcomes from this type of RCT would determine the importance of individual *choice* on intervention effectiveness, rather than whether a particular style of intervention works best.

Positive findings from the intervention study indicate the need for future research that examines the effectiveness of a PA consultation intervention for overweight women with T2DM and depression. Thus, it would be interesting if future RCT research could be conducted to examine the effects of a large scale PA consultation intervention, based on the design used by Kirk et al. (2007) and Loughlan and Mutrie's (1995) guidelines. This could include three conditions: a PA consultation (intervention) condition; standard care (control) condition receiving standard medical care only; and a standard care plus support (control) condition, which provides participants with an equal amount of support and time as those in the PA consultation group, but without the proposed active content of the consultation. The results of studies

employing this type of RCT design, ideally with the inclusion of qualitative (e.g., repeated semi-structured interviews) and self-report and objective measures of PA, alongside diabetes control indicators, would provide useful information on the effects of specific PA consultation techniques and the effects of support only. Consequently, such knowledge would help guide the development of psychological interventions designed specifically for overweight women with T2DM and depression.

Implications for Practice

This thesis highlights both the negative relationship between depression and PA in overweight women with T2DM, and the positive findings of an intervention designed to increase PA and improve mood (e.g., reduce depression) in this population. The findings presented in the thesis might have implications for health professionals who work with overweight women with T2DM, such as diabetes specialists, weight loss/management specialists, general practitioners, psychologists, and exercise professionals. In particular, considering outcomes from Study 2, and previous research (Schutzer & Graves, 2004), diabetes specialists should keep in mind the potential, yet influential role they play in the PA behaviour of their clients, and therefore, the value of these findings in their practice. Additionally, relatives and friends of these women may find the results and discussion presented in this thesis valuable, and applicable to their everyday activities and lives.

The finding of a high prevalence of mild to severe depression in overweight women with T2DM (in Study 1), and the negative relationship between depression and PA, including in lifestyle activities (demonstrated in all three studies of the current thesis), can have implications for all people who work or live with, overweight women with T2DM. Individuals with multiple health conditions are at a much higher risk of

inactivity and developing additional health conditions. Thus, it is very important that health professionals and general public alike understand the high risk of depression for this population, and how experiencing depression can have a debilitating influence on these women's ability to engage in everyday activities, such as active housework. Therefore, being aware of signs and symptoms of depression may allow for early diagnosis and treatment, and minimise the negative influence of depression. Health professionals who are not qualified to diagnose or provide specialised treatment for depression, and/or who do not have a working knowledge of psychological conditions, should have a mental health referral system, including different health professionals (e.g., psychologists) to whom they can refer clients with signs of depression. Additionally, to assist with identifying those in need of referral for additional psychological assistance, further training may be needed in recognising and assessing symptoms of depression and employing depression measures (e.g., self-report questionnaires, such as the HADS) for regular monitoring. Furthermore, additional training in appropriate support and advice to offer their clients with depression should be considered.

The conclusion from combining findings from all three studies in the current thesis of a negative relationship between depression and PA has particular implications for people who live or work with overweight women with T2DM and health professionals aiming to promote PA among this population, such as exercise professionals and exercise psychologists. Specifically, these findings indicate the potential difficulty these women experience with everyday activities involving physical exertion, including housework, not only because of possible FL (e.g., related to multiple health conditions), but because of the additional negative influence of depression on their perceived ability and desire to engage in PA. It is important to understand that

depression can negatively impact on perceived ability, and that women with depression may find it difficult to carry out everyday tasks, let alone engage in a level of PA recommended for health benefits. Thus, these findings highlight that when health professionals should aim to increase PA participation in overweight women with T2DM and depression, they should take into account each individual's base level fitness and ability, and encourage small increments in PA as appropriate, rather than promoting a pre-determined exercise regimen involving a set PA level and intensity (e.g., at least 30 minutes of moderate-intensity exercise each day), which may be an unrealistic expectation, at least in the initial stages of PA behaviour change. Additionally, family members and professionals who are working with this population to increase their PA behaviour, need to be aware of the potential influence of depression for these individuals, and be supporting and encouraging during these times. This may also be an important time for health and exercise professionals conducting existing PA programs, particularly in exercise settings that involve pre-determined exercise sessions, to employ one or more strategies or components from the intervention study that were identified as being useful. In particular, useful strategies were those that facilitated intrinsic motivation and PA self-efficacy, such as identifying and overcoming PA barriers, process-oriented goal setting, and support phone calls. Chosen strategies/components should be tailored to suit the needs of their client, and are likely to be beneficial to enhance their future attendance and PA adherence.

Chapter 4 (Study 2) highlighted relevant barriers and facilitators to PA for overweight women with T2DM and depression. To reiterate, it is important for health professionals to be aware of these factors when working with this population for increasing their PA participation. For example, health professionals should be aware of the negative influence of physical problems and restrictions on the individual's ability

to be active, and prescribe or encourage activities that are considered enjoyable (or at least that the individual might like to try), and do not exacerbate discomfort. This suggestion is reinforced by previous research outcomes showing that overweight people with T2DM (particularly females) have an impaired (lower) exercise capacity (Ribisl et al., 2007). The facilitators of PA identified in the current thesis could also be encouraged and implemented into PA programs by professionals. For example, professionals should ensure ample opportunities are provided for social support, promoting the physical and psychological benefits of regular PA, and identifying and encouraging lifestyle opportunities for being active relevant to the individual's everyday life.

For the remainder of this section, I discuss implications for practice that arose specifically from the psychological intervention (Study 3). At this point, it is important to acknowledge the qualitative nature of Study 3. Using repeated interviews was a particular strength of this study, allowing for an in-depth insight into participants' experiences of taking part in the intervention, and changes in their PA intention and behavior, and their mood during the follow-up period. Nonetheless, because of the small sample size, the implications that arise from this study need to be considered to be tentative.

One implication relates to the way PA consultation interventions are conducted with people with depression. Outcomes from this study highlight the need for health professionals and researchers to encourage PA participation by ensuring the techniques and strategies used to promote PA are tailored to the specific needs and abilities of the their clients or individuals in their study, rather than a generic, pre-determined set of strategies, or exercise program, applied to everyone. Support for the way the intervention was conducted in this study arises from the 100% retention rate for the 24-

week study period. I consider that the high retention rate was, at least in part, due to the individualised design of the intervention, which took into consideration the personal circumstances, needs, and abilities of each participant.

Another implication arises from a particular strength of the intervention study: the provision of support and encouragement provided to participants throughout the intervention, delivered by me in my role as counsellor, offered a continuity-of-care type program. The benefit of this was demonstrated by the finding that most women (particularly those with a high level of depression) valued this verbal support and encouragement, which assisted with their PA motivation and participation. In conducting PA consultation interventions for increasing PA intention and participation among overweight women with T2DM and depression, practitioners should consider providing their clients/participants with ongoing support and encouragement throughout the intervention period, preferably delivered by the same professional.

Findings from the intervention study demonstrate the potential utility of PA consultation interventions for simultaneously influencing multiple health behaviours. For example, in addition to increased PA intention and participation, some women reported that participating in the LPAC intervention had motivated them to improve their dietary habits and/or carry out more regular blood sugar readings. This encouraging finding has particular implications for practitioners in health care settings where time is limited. That is, perhaps PA consultation interventions would be an effective way to promote behaviour change in multiple areas of health, particularly those related to diabetes and weight management.

Relevance of Thesis Outcomes to Other Populations

The findings of the current thesis may also be relevant to a wider proportion of the community, not just overweight women with T2DM and depression. The need for research focusing on promoting PA participation and adherence in other populations is vitally important. Our increasingly automated lifestyle, at least in Western countries like Australia, has substantially reduced people's need for daily obligatory PA (NSW PCAL, 2010; Sherwood & Jeffery, 2000). Moreover, it has facilitated sedentary living (e.g., use of labour saving devices such as automobiles, escalators, remote controls, and internet). This is problematic, because sedentary behaviour is associated with health risks independent of PA behaviour (Dunstan et al., 2005; Patel et al., 2010; Salmon et al., 2000).

Additionally, depression can affect anybody in the population. One in five Australian adults will experience a mental illness, such as depression, at some stage of their life (AIHW, 2010). As mentioned, people with chronic health problems are two times more likely to experience a mental illness than people without a chronic health problem (Pfizer Australia, 2006). In the current research, I have focused on the chronic health conditions of T2DM and overweight. Other chronic conditions where a high prevalence of depression has been reported include CHD (Reddy, Dunbar, Morgan, & O'Neil, 2008; Rogerson, 2009), kidney disease (Iliescu, Yeates, & Holland, 2004), chronic obstructive pulmonary disease (Wilson, 2006), cancer (Massie, 2004), and multiple sclerosis (Marrie et al., 2009).

Regular PA has been shown to reduce depression in the general population (Ball, Burton, & Wendy, 2008), and individuals with chronic health problems, such as multiple sclerosis (Sutherland, Andersen, & Stoove, 2001), cardiovascular disease

(Dugmore et al., 1999), CHD (Rogerson, 2009), knee osteoarthritis (Penninx et al., 2002), and breast cancer (Mustian, Katula, & Gill, 2002). Unfortunately, however, nearly three-quarters (70%) of Australian adults do not engage in enough PA to obtain health benefits, and the rate of inactivity is higher among people with depression, and those reporting chronic conditions (ABS, 2006b, 2009). Thus, considering the positive findings of the benefit of PA consultation, particularly for overweight women with T2DM and depression (as in the current thesis), men and women with T2DM (Kirk et al., 2004), and people with CHD with or without depression (Rogerson, 2009), the psychological intervention conducted in the current research may prove to be relevant for people experiencing depression, either with or without other chronic health problems. The benefits to be gained from employing PA consultation in various populations could be far reaching. For example, this may result in higher PA levels and reduced depression for these individuals, which would translate into improved physical and psychological health, enhanced quality of life, and reduced financial costs, for the individual and society at large. Thus, researchers in the area of exercise psychology have an important role to play in helping to increase PA participation and adherence, for example, by investigating the effectiveness of psychological interventions, such as PA consultation, in various populations at risk of depression and inactivity.

Concluding Comments

The current research examined the important issue of PA and depression in overweight women with T2DM, a population at high risk of both inactivity and depression. The three studies I conducted provided information on the relationship between PA and depression, the PA barriers and facilitators for overweight women with T2DM and depression, and the effectiveness of a psychological intervention designed to increase PA participation and adherence for overweight women with T2DM and

depression. On a personal note, the process of designing, conducting, analysing, and writing up this research has been mentally and emotionally challenging. Nevertheless, the challenges and obstacles I have overcome have contributed to making the completion of this thesis an incredibly rewarding experience, and I have developed and gained numerous skills that I am sure will be valuable for me professionally in the future.

On a professional and academic level, I believe this thesis has made an important and original contribution to the field. The research has yielded some important insights into the PA experiences of women with multiple chronic conditions. Specifically, more is now known about the negative relationship between depression and PA, the facilitators that encourage, and barriers that hinder, PA participation, and about one type of psychological intervention that could assist in increasing PA intention and participation, and enhancing mood, in overweight women with T2DM. The content of this thesis is relevant for researchers exploring mood (particularly depression) and current PA in overweight women with T2DM, or practitioners aiming to promote PA participation and adherence in this population. In addition, this research could be applied to people with other chronic health problems who are experiencing depression, and are having difficulty either beginning or adhering to PA. I hope the findings and discussion presented in this thesis will prompt other researchers to further investigate effective ways to encourage PA participation and adherence, particularly for people with depression and chronic health problems.

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Appendix A

Outcomes from Research and Reviews Comparing the Health Benefits of Lifestyle Physical Activity and Exercise

Table A2.4

Outcomes from Research and Reviews Comparing the Health Benefits of Lifestyle Physical Activity and Exercise

Researchers	Design	Intervention	Population	Outcomes	Results
Dunn et al., (1999)	RCT* labelled "Project Active"	24 months (6 month intensive intervention and 18 month maintenance intervention) of either: *Lifestyle PA* (accumulate >30min of moderate-intensity PA in to daily schedule); or *Traditional structured exercise* (50-85% maximum aerobic power, 20-60min duration, centre based)	Sedentary overweight men (*n* = 116) and women (*n* = 119) aged 35-60 years.	PA, cardiovascular fitness, and CVD risk factors *6-month & after the 24 month program*	Comparable improvements in PA, fitness, and decreased systolic & diastolic BP, even among those who fell short of the PA goal; Neither group significantly changed weight, but each group significantly reduced their percent of body fat; PA adherence was better in the lifestyle intervention group compared to the structured exercise group; Lifestyle intervention was significantly more cost-effective than the structured exercise intervention ∆ Lifestyle PA is an effective alternative to structured exercise for achieving PA adherence and health benefits

Andersen et al., (1999)	RCT*	16-week program of either: *Lifestyle PA* (accumulate >30min of moderate-intensity PA in to daily schedule s); or *Structured (vigorous) exercise* (30-45min step aerobics class, 3 per week) (+ low fat diet ~1200kcal per day)	Sedentary obese women (*N* = 40) aged 22-60 years	Changes in body weight, body composition, CVD risk factors, and physical fitness *After 16 weeks & 12 month follow-up*	Structured exercise resulted in significantly greater sparing of lean tissue; Comparable and significant reductions in CV risk factors; During 1 year follow-up, structured exercise group regained more weight (1.6kg) than lifestyle group (0.08kg). ∆ Lifestyle PA offers similar health benefits and is a suitable alternative to structured exercise for obese women.
Fontaine et al., (1999)	RCT*	13-week program of either: *Lifestyle PA* (encouraged to increase PA throughout day); or *Traditional aerobic PA* (aerobic exercise of choice, 3-4 times per week) (+ individualised reduced calorie and reduced fat diet; Cognitive Behavioural Therapy group meetings)	overweight adults (*N* = 38)	Health-Related QOL (measured by the SF-36), depressive symptoms (measured by the BDI) *After 13-week program*	Both groups achieved equivalent weight loss (average 6.8kg), reductions in depressive symptoms, and improved HRQL. No significant difference between the groups on any of the study measures. ∆ Lifestyle PA an effective way to increase PA and achieve weight loss and psychological improvement.

Murphy et al., (2002)	Cross-over design	Two 6-week programs of brisk walking, with an interval of 2-weeks: One program comprised of one 30-min walk per day (long bout), 5 days a week (long bout); and The other program comprised of three 10-min walks per day (short bouts), 5 days a week (consistent with the 'active living' concept, particularly lifestyle PA). All walking done at 70-80% predicted max HR.	21 Sedentary men (*n* = 7) and women (*n* = 14), mean age = 44.5years	Aerobic fitness (indicated via VO2 max), body composition, resting arterial blood pressure, fasting plasma lipoprotein variables, and psychological parameters (tension and anxiety) *Assessed before and after each program*	Both walking patterns resulted in physical benefits, and similar decreases in tension and anxiety. People found accumulating the shorter bouts of PA more maintainable than the longer bouts. ∆ Short bouts of PA accumulated throughout the day has similar physical and psychological health benefits compared to longer bouts of exercise (same total duration).
Blair & Church (2003)	Informative article	Importance of PA and cardio-respiratory fitness for people with T2DM	People with T2DM	Health benefits of PA (three 10-min walks a day); How to increase adoption of PA in patients.	Physicians should emphasise to their patients that the principle benefit of regular PA is protection against CVD and ACM Purports that traditional, structured exercise does not work well for everyone, a lifestyle intervention offers more flexibility and encourages people to incorporate 30min of PA into their daily routine. This article promotes the "active living" concept .
Dubbert (2002)	Review	Overview of major developments in PA and exercise for health promotion and disease	General population	Current PA recommendations ; Health benefits of PA and exercise;	For details on the outcomes of this review, readers are referred to: Dubbert, P. (2002). Physical activity and

		prevention over the last 10 years; and the challenges facing psychologists interested in PA, behavioural medicine, and public health.		Theories and models for the study of PA and exercise; Current status of PA participation and adherence to guidelines; Advances in assessment of PA; Interventions to promote PA in home and community settings	exercise: recent advances and current challenges. *Journal of Consulting and Clinical Psychology*, *70*(3), 526-536.
Marcus et al., (2006)	Qualitative Review	Overview of existing PA intervention research (within specific populations and across difference delivery modalities); offers new ideas and recommendations to improve the knowledge base within each area, and propose ideas to help bridge across these existing categories of research.	Subpopulation groups (different age groups, and within underserved populations); and Intervention modalities (healthcare or physician delivered, work-site, mediated, environmental, and multiple behaviour change interventions).	Effective interventions to promote PA behaviour change. Recommendations to improve the existing knowledge base on ways to enhance PA participation within each subpopulation.	Support for interventions promoting PA behaviour that are theory based (e.g., transtheoretical model), and use behaviour modification, Exercise professionals are encouraged to advocate lifestyle PA encouraged as an alternative to structured exercise.

Note. * = Randomised Controlled Trial; ∆= Conclusion from study.

Appendix B

Prevalence of Diabetes, Overweight, Depression, and Physical Inactivity among Various Worldwide (Western) Populations

Table B2.5 displays the worldwide prevalence of diabetes, overweight, depression, and physical inactivity in various populations (general population, people with diabetes, overweight, depression, or physically inactive individuals). The most recent and available statistics at the time of publication of this thesis are reported. Blank spaces in the tables represent redundant categories. Where prevalence figures could not be obtained, evidence of risk is reported.

Table B2.5

Prevalence of Diabetes, Overweight, Depression, and Physical Inactivity among Various Worldwide (Western) Populations

Health Problem	Population				
	General	Diabetes	Overweight	Depression	Sedentary
Diabetes	Current prevalence: ≥ 220million people* (90% of cases being T2DM)[1] Predicted prevalence: by the year 2025, more than 333 million people will have diabetes*[2]		The risk of T2DM rises steeply with increasing body fatness. Approximately 80% people with T2DM are overweight (BMI ≥ 25)[21]	Depression increases risk of diabetes[3]	Physical inactivity is a main risk factor for diabetes[1, 4, 5]e.g., an estimated 20.8% of the US-Canadian difference in diabetes prevalence is associated with PA level)[5]
Overweight	Current prevalence: Approximately 1.6 billion overweight adults (aged 15 years or more), with at least 400 million of them being obese**[6] Prediction prevalence: By	More than half (58%) of diabetes cases are attributable to a higher BMI (BMI > 21)[7]		Depression increases risk of obesity[8]	Physical inactivity is a main risk factor for overweight[7, 9]

	the year 2015, around 2.3 billion adults will be overweight and over 700 million of them will be obese[6]				
Depression	Current prevalence: Approximately 121 million people experience depression[10]	People with diabetes (particularly T2DM and women) are twice as likely to be depressed, than people without diabetes[11] Depressive symptoms more prevalent than CD: 31% vs. 11%)[11] (refer to Appendix E, Table E2.8 for prevalence studies on depression prevalence in diabetic population)	Overweight people (particularly women) more likely than normal weight people to experience depression[8, 12] (refer to Appendix C, Table D2.7 for prevalence studies on depression prevalence in overweight population)		Physical inactivity increases risk of depression[13]
Sedentary	More than half (60%) of world's population are insufficiently active[14] Women more inactive than men[14] Poor adherence to exercise programs: around 50% drop out within 3 to 6 months[15, 16]	High prevalence of inactivity among people with diabetes; Greater physical inactivity prevalence among people with diabetes than people without diabetes [16] Research outcomes on physical inactivity prevalence: people with diabetes vs. people without diabetes (diabetes type in parenthesis): **Canada:** 52.3% vs. 47.3% (diabetes	Obese people report less PA than normal weight people[6]	High prevalence of physical inactivity among people with depression (e.g., in America, adults with depression are one-third less likely to be active than those without depression)[20]	

		type not specified)[17] **America**: a. 70% vs. 56.6% (diabetes type not specified)[17]; b. 61% vs. 42% (type 1 and T2DM)[18]; c. adults with T2DM: 31% reported no PA; 38% reported insufficient PA[19]

Note. * Prevalence rates and prediction do not include undiagnosed cases. For every known case of diabetes, there is one undiagnosed case (Barr et al., 2006; Dunstan, Zimmet, Welborn, et al., 2002; King & Rewers 1993); ** Worldwide epidemic is increasing at such a pace that prevalence statistics are rapidly outdated (Prentice, 2006); [1]World Health Organization. (2009a). Diabetes Fact Sheet. Retrieved from http://www.who.int/mediacentre/factsheets/fs312/en/print.html; [2]International Diabetes Federation . (2003). New diabetes figures. Retrieved from http://www.idf.org/new-diabetes-figures; [3]Brown, L., Majumdar, S., Newman, S. & Johnson, J. (2005). History of depression increases risk of type 2 diabetes in younger adults. *Diabetes Care, 28,* 1063-1067; [4] Sullivan, P., Morrato, E., Ghushchyan, V., Wyatt, H. & Hill, J. (2005). Obesity, inactivity, and the prevalence of diabetes and diabetes-related cardiovascular comorbidities in the U.S, 2000-2002. *Diabetes Care, 28,* 1599-1603; [5]Zhang, X., Geiss, L., Caspersen, C., Cheng, Y., Engelgau, M., Johnson, J., Plotnikoff, R. & Greff, E. (2010). Physical activity levels and differences in the prevalence of diabetes in the United States and Canada. *Preventive Medicine, 6.* doi:10.1016/j.ypmed.2010.02.015; [6]World Health Organization. (2009d). Overweight and obesity Fact Sheet Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/print.html; [7]World Health Organization. (2003). *Obesity and Overweight Fact Sheet.* Retrieved from http://www.who.int/hpr/NPH/docs/gs_obesity.pdf; [8]Luppino, F., de Wit, L., Bouvy, P., Stijnen, T., Cuijpers, P., Penninx, B. & Zitman, F. (2010). Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry, 67*(3), 220-229.; [9]Lindstrom, M., Isacssomn, S. & Merlo, J. (2003). Increasing prevalence of overweight, obesity and physical inactivity. *European Journal of Public Health, 13,* 306-312. [10]World Health Organization. (2009b). Depression Fact Sheet. Retrieved from http://www.who.int/mental_health/management/depression/definition/en/print.html.
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Appendix C

Prevalence of Diabetes, Overweight, Depression, and Physical Inactivity among Various Australian Populations

Table C2.6 displays the Australian prevalence of diabetes, overweight, depression, and physical inactivity in various populations (general population, people with diabetes, overweight, depression, or physically inactive individuals). The most recent an available statistics at the time of publication of this literature review are reported. Blank spaces in the tables represent redundant categories. Where prevalence figures could not be obtained, evidence of risk is reported. With reference to Australian data, the Australian Bureau of Statistics (ABS) data provides a general indication of population trends over time. Thus, I report ABS statistics. It is important to note however that in regards to depression prevalence, ABS gathers data on self-reported long-term mental problems (participants were not specifically asked whether they had been clinically diagnosed) and psychological distress (assessed using the Kessler Psychological Distress Scale-10 questionnaire). Thus, outcomes reflect depressed mood, rather than clinical depression. Furthermore, in regards to physical activity (PA) participation, the ABS survey only includes self-report PA relating to sport, recreation, or exercise. It excludes occupation, and lifestyle PA's. Consequently, ABS data does not provide a comprehensive analysis of people's overall PA levels.

Table C2.6

Prevalence of Diabetes, Overweight, Depression, and Physical Inactivity among Various Australian Populations

Health Problem	Population				
	General	Diabetes	Overweight	Depression	Sedentary
Diabetes	Prevalence is steadily rising (e.g., 2.4% in 1995 to 4.0% in 2008)[1] Current prevalence: Approximately 818, 200 of Australians* (all ages; 88% of cases being T2DM[2]		Overweight adults are three times more likely, and obese adults 10 times more likely to develop T2DM than general population[3]		Incidence (p.a.) of diabetes is nearly doubled in sedentary individuals compared to physically active individuals (1.1% vs. 0.6%)[2]
Overweight	Proportion of Australians reporting overweight and obese have been	More people with diabetes are overweight compared		People with mental health problems more likely than those	Physically inactive people are more likely to be obese

	increasing by about 1% a year since 1980[3] Current prevalence: More than half (56%) of Australian adults are overweight[2] Australia is considered the fattest nation[1]	to adults from the general population (69% vs. 51%)[4]		without mental problems to be overweight (16% vs. 13%) People with a very high level of psychological distress are more likely than those with a low level of psychological distress to be overweight (2.6% vs. 0.9%)[5]	than people who regularly engaged in moderate to high levels of exercise (20% vs. 13%)[6]
Depression	In last 15 years, prevalence of long term mental or behavioural problems has almost doubled[2] Current prevalence: -lifetime mental disorders: one in five (20% or 3.2 million) Australian adults[8, 10] -Affective disorders: 6.2%[10] More women than men (7.1% vs. 5.3%) experience higher rates of affective disorders[10] -Psychological distress: Moderate levels experienced by 21% of Australians; and 9% have high levels)[2]	Adults with self-report diabetes are more likely than adults without diabetes to report very high levels of psychological distress (3.7% vs. 7.6% vs. 3.7%)[4]	Overweight/obese people are more likely than normal weight people to suffer from mental problems like depression[8, 9, 10] Current prevalence: -affective disorder: underweight/normal; overweight, obese, respectively[10]: All persons: 6.5%, 5.3%, 7.0% Male: 6.3%, 4.0%, 6.5% Female: 6.6%, 7.7%, 7.5%		Current prevalence: -affective disorder: sedentary, low, moderate/high exercise level, respectively[10]: All persons: 6.5%, 5.3%, 7.0% Male: 5.5%, 5.0%, 5.6% Female: 9.1%, 5.9%, 9.0% -Inactive Australians are more likely to be classified as having high or very high levels of psychological distress than regularly active people (15% vs. 9%)[6]

Sedentary	Nearly three-quarters (70%) of Australian adults insufficiently active. This figure has not changed significantly over the last 10 years (69% in 1995, 69% in 2001, and 70% in 2004-05)[2, 6] Women (aged 15 or older) more likely to be sedentary or have low levels of PA than Men (73% vs. 66%)[6]	Adults (aged 15 years or more) with diabetes are more likely to be physically inactive than those without diabetes (74% vs. 69%)[2, 4]	Obese people are more likely than normal weight people to report physical inactivity (34.8% vs. 30.4% for men, and 38.2% vs. 30.2% for women), and are less likely to have participated in high levels of PA (4.9% vs. 7.6% for men, and 1.7% vs. 4.6% for women)[9]	Three-quarters (75%) of adults (aged 15 years or more) with a mental health problem (e.g., depression) engage in low levels of exercise[7] Adults with a high to very high level of psychological distress are more likely than those with a low level of psychological distress to report being physically inactive (48% vs. 31%)[7]

Note. * Prevalence rates and prediction do not include undiagnosed cases. For every known case of diabetes, there is one undiagnosed case (Barr et al., 2006; Dunstan, Zimmet, Welborn, et al., 2002; King & Rewers 1993); [1]Australian Bureau of Statistics. (2008). *2008 Year Book Australia. Cat. no. 1301.0.* Canberra: Australian Bureau of Statistics; [2]Australian Bureau of Statistics. (2009). *National Health Survey 2007-08: Summary of Results. Cat. no 4364.0.* Canberra: Australian Bureau of Statistics; [3]National Health and Medical Research Council (2003). Clinical practice guidelines for the management of overweight and obesity in adults. Commonwealth of Australia: ACT; [4]Australian Bureau of Statistics. (2006c). Diabetes in Australia: A Snapshot, 2004-05. Retrieved from http://www.abs.gov.au/Ausstats/abs@.nsf/e8ae5488b598839cca25682000131612/28dba2bc450f59e0ca256e850075e8c2!OpenDocument; [5.]Australian Bureau of Statistics. (2001). *National Survey of Mental Health Australia, 2001.* Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4811.0Main+Features12001?OpenDocument; [6]Australian Bureau of Statistics. (2006b). Physical activity in Australia: a snapshot, 2004-05. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/4835.0.55.001; [7]Australian Bureau of Statistics. (2006a). Mental Health in Australia: A Snapshot, 2004-05. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/4824.0.55.001; [8]Australian Institute of Health and Welfare. (2008). *Australia's health 2008. Cat. no. AUS 99.* Canberra: AIHW.; [9]Australian Institute of Health and Welfare: O'Brien, K. & Webbie, K. (2004). *Health, wellbeing and body weight: characteristics of overweight and obesity in Australia, 2001. Bulletin No. 13. AIHW Cat. no. AUS 43.* Canberra: AIHW; [10]Australian Bureau of Statistics. (2008). *National Survey of Mental Health and Wellbeing: Summary of Results.Cat no. 4326.0.*

Appendix D

Research Outcomes on Depression Prevalence in Overweight People

Table D2.7

Prevalence of Depression (Clinical Depression and Depressive Symptoms) in Overweight (BMI ≥ 25) People

Researchers	Country where study was conducted	Participants (including source)	Depression measure and cut-off	Depression severity classification	Prevalence	Race/ethnic differences in depression prevalence**
Simon et al. (2006)	America	9125 men and women [25% obese (BMI ≥ 30); mean age = 44.8 years; 51.4% women) (sample source: the National Comorbidity Survey Replication- a nationally representative sample of the US general population)	WHO Composite International Diagnostic Interview (CIDI)	Mood and anxiety disorders (based on criteria for the DSM-IV Diagnoses)	Overall prevalence of mood disorder: Men: 14.9% Women: 23.1% Mood disorder prevalence if BMI <30: Men: 14.3% Women: 22.1% Mood disorder prevalence if BMI ≥ 30: Men: 16.9% Women: 26.6% Gender disparity: non-obese and obese women more likely than non-obese and obese men to	Yes: Association between obesity and mood disorder was stronger in Non-Hispanic whites (Odds Ratio: 1.38) compared to Hispanic, African American, or other racial/ethnic groups. Difference highlights the important role of social or cultural factors in mediating or moderating the relationship between obesity and mood

					experience depression	
Carpenter, Hasin, Allison, & Faith (2000)	America	40,086 African American and White adult men and women (aged 18 years and older) interviewed in a national survey (sample source: the 1992 National Longitudinal Alcohol Epidemiology Survey, which involved 42,862 face-to-face interviews with household residents 18 years or older -a nationally representative sample of the US general population)	Clinical interview (using the Alcohol Use Disorders and Associated Disabilities Interview Schedule). Questions operationalised DSM-IV criteria for major depression.	Major Depression	Men: lower BMI associated with major depression Women: obesity (BMI ≥ 30) associated with a 37% increased probability of major depression Gender disparity: obese women more likely than obese men to experience depression	No: No racial difference between African American and White participants
Scott, McGee, Wells, & Browne (2008)	New Zealand	12,992 adults (aged 16 years or more). BMI ≥ 30: *n* = 3,570	Depression measure: Composite International	Mood and anxiety disorders (based on criteria for the DSM-IV	Anxiety and mood disorder prevalence increased with increasing obesity	Three ethnic groups categories: Maori, Pacific Island, and Others.

	(A nationally representative sample of general population who took part in a face-to-face household survey: the New Zealand Mental Health Survey)	Diagnostic Interview (CIDI) 3.0. Disorders assessed using the DSM-IV definitions and criteria:
		1. mood disorders
		2. major depression
		3. anxiety disorders
		(statistics not reported in this table)
			Diagnoses)	severity.
				
				1. Mood Disorders (12-month prevalence):
				if BMI 18.5-29.9:
				Men and Women: 7.5%
				Men: 6.3%
				Women: 8.7%
				
				if BMI ≥ 30:
				Men and Women: 9.1%
				Men: 5.8%
				Women: 12.0%
				
				2. Major depression (12-month prevalence)
				If BMI 18.5-29.9:
				Men and Women: 5.3%
				
				if BMI ≥ 30:
				Men and Women: 6.7%
				
				Gender differences not provided.
				
				Overall: Obesity significantly related with any mood disorder (Odds Ratio
					obesity and any anxiety disorder were significantly related only in the Other ethic group.
					No other significant ethnic differences reported.

					(OR): 1.23) and major depression (OR 1.27) Gender disparity: association between obesity and mood disorders only significant among women.	
Zhao et al. (2009)	America	177,047 men and women (aged 18 years and more; 60.9% women; 36.6% had a BMI between 25-29.9; 26% had a BMI ≥ 30) (sample source: the 2006 Behavioral Risk Factor Surveillance System, a population based telephone survey of health-related behaviours regarding leading causes of death among non-institutionalized US adults)	1. Current Depression: Patient Health Questionnaire-8; cut-off score ≥ 10 2. Lifetime diagnosed depression and anxiety (LDDA): assessed by asking respondents whether they had ever been told by a doctor/health care provider that they had a depressive or anxiety disorder.	1. Current Depression 2. LDDA	Men: 1. Current Depression: Class III obese (BMI ≥ 40) men 38% more likely to experience current depression 2. LDDA: Class III obese men 40% more likely to have lifetime diagnosed depression and 42% more likely to have lifetime diagnosed anxiety; Underweight men were 85% more likely to have diagnosed depression during their lives Women: 1. Current Depression:	Yes: Compared to Non-Hispanic Black, Hispanic, and other race/ethnic groups, Non-Hispanic whites had the lowest prevalence of Current Depression but the highest prevalence of LDDA; Non-Hispanic Blacks had the lowest prevalence of LDAA

					Overweight (BMI ≥ 25) women were 17-31% more likely to have current depression 2. LDDA: Overweight (BMI ≥ 25) women 17-53% more likely to have diagnosed depression , and 9-17% more likely to have diagnosed anxiety Gender disparity: Regardless of disease status (e.g., diabetes, myocardial infarction, angina, stroke, asthma), women had a significantly higher prevalence of current depression and LDDA than men with the same conditions	
Heo, Peitrobelli, Fontaine, Sirey, & Faith (2006)	America	44,800 men and women (aged 18 years or more) (sample source: the 2001	Depressed Mood: if felt sad, blue, or depressed at least for:	Depressed Mood:	Overall prevalence (men and women): 1. DM7: 14.3%; 2. DM14: 7.8%	Yes: Hispanic women appear much more prone to depressive mood than women

	Behavioral Risk Factor Surveillance Survey telephone interview- a nationally representative sample of US adults)	1. seven days (DM7); or 2. 14 days (DM14) In the previous month.	Men aged 18-64yrs: 1. DM7: Not overweight (BMI < 25): 12.3% Overweight (BMI 25-29.9): 11.6% Obese (BMI ≥ 30): 11.7% 2. DM14: Not overweight: 6.3% Overweight: 6.0% Obese: 6.9% Women aged 18-64yrs: 1. DM7: Not overweight: 16.1% Overweight: 18.0% Obese: 23.2% 2. DM14: Not overweight: 7.8% Overweight: 9.6% Obese: 14.0% Gender disparity: obese women twice more likely than obese men to experience depressed mood for at least 2 weeks (14% vs. 6.9%)	from other ethnic groups analysed (‘white’ or ‘ black’).

Johnston, Johnson, McLeod, & Johnston (2004)	Canada	2431 men and women (aged 18 years or more) Acceptable weight (BMI 18.5-24.9; *n* = 935); Overweight (BMI 25-29.9; n = 886); and Obese (BMI ≥ 30; *n* = 610) (sample source: the 1995 Nova Scotia Health Survey- a nationally representative sample of residents from the provincial medical insurance registry)	CES-D; cut-off score ≥ 16	Elevated risk for depression	Overall depression risk (CES-D ≥ 16) for: Obese men and women: 18.4% Non-obese men and women: 12.8% Gender disparity: in all weight categories (acceptable, overweight, obese), and age categories (18-34 years; 35-64 years; 65 years and older) females more likely than males to report depressive symptoms. For example, depression risk for obese males and females aged 35-64 years: 7.5% vs. 9.6%	N/A Race/ethnicity information not presented
Tuthill, Slawik, O'Rahilly, & Finer (2006)	United Kingdom	253 obese (average BMI 47.5) men and women (aged 18 years or more) [Individuals were seeking weight-	HADS; two cut-off scores used	HADS score ≥ 8: at least mild depressive symptoms; HADS score >15: severe depressive symptoms	Men and women with mild depressive symptoms: 47.5% vs. 47.8% Men and women with Severe depressive symptoms: 18% vs.	N/A: Participants in this study were predominantly of Caucasian ethnicity.

	management treatment at one of two UK specialist centres: Luton and Dunstable Hospital NHS Trust, and Addenbrooke's Hospital NHS Trust (all patients were referred by their physician or from another hospital specialist)]	22% Gender disparity: similar proportion of obese men and women reporting at least a mild level of depressive symptoms; more women than men reporting a severe level.

Appendix E

Research Outcomes on Depression Prevalence in People with Type 1 and/or Type 2 Diabetes Mellitus

Table E2.8

*Prevalence of Depression (Clinical Depression and Depressive Symptoms) in People with Type 1 and/or Type 2 Diabetes Mellitus**

Resarchers	Country where study was conducted	Participants (including source)	Depression measure and cut-off	Depression severity classification	Prevalence	Race/ethnic differences in depression prevalence**
Anderson, Freedland, Clouse, & Lustman (2001)	Meta-analyses (controlled and uncontrolled studies)	Men and women with type 1 or type 2 diabetes	CD (assessed by clinical interview); and Depressive symptoms (assessed using self report measures)	Three classifications used: 1. “depression” (CD and depressive symptoms); 2. CD; and 3. depressive symptoms	‘1. Depression’: Depression risk doubled in people with diabetes compared to those without diabetes; Gender disparity: more women (28%) than men (18%) reporting depression 2. CD: Men and women: 11.4% 3. Depressive symptoms: Men and women: 31%	N/A Anderson et al. noted that failure to report race of ethnicity is common in the psychosocial literature on diabetes.

Ali, Stone, Peters, Davis, & Khunti (2006)	Meta-analysis (including 10 controlled studies; *N* = 51,331)	Men and women with and without T2DM	Clinically relevant depression (assessed either by self-report or diagnostic interviews)	Clinically relevant depression	1. depression prevalence: People with T2DM: 17.6% (equates to one in six people with T2DM) People without T2DM: 9.8% Overall, depression risk nearly doubled for people with T2DM compared to those without T2DM; Gender disparity: Females both with diabetes and without experienced a higher prevalence of depression than men	N/A
Pouwer et al. (2010)	Netherlands	772 adults with Type 1 or Type 2 diabetes (out-patients from three diabetes clinics)	Depressive affect: a) World Health Organisation-5 Well being Index (WHO-5), a score < 52 (indicative of poor emotional well-being), and a	1. Depressive affect 2. Depressive disorder	1. depressive affect in men and women with T2DM: a)WHO-5 score < 52: 37-43% b) WHO-5 score < 29: 18-25% b) CESD: 35-38%	Yes: About one-quarter of participants with T2DM reported a foreign ethnic background (Dutch,

			score < 29 (indicative of depressoin); b) CESD, a score ≥ 16 (indicative of depression) Major Depressive Disorder (MDD): a) the Composite International Diagnostic Interview (CIDI)		2. MDD (CIDI) : Men: 2% Women: 21% Gender disparity: more women than men with MDD Higher BMI, ethnic minority, and neuropathy were associated with higher levels of depression.	Moroccan-Dutch, Turkish-Dutch,or other). Depression risk was significantly associated with ethnic minority (i.e., non-Dutch descent; OR 2.21; 95% CS 1.8-5.9).
Li, Ford, Strine, & Mokdad (2007)	America	18, 814 adults (aged 18 years or more) with Type 1 or Type 2 diabetes (58% women; 88% Type 2; mean age: 62 years) (sample source: the 2006 Behavioral Risk Factor Surveillance System, a population based telephone survey of health-related	1. Minor Depression: Patient Health Questionnaire-8 (PHQ-8): the presence of two or four of the eight PHQ-8 criteria 2. Major Depression: PHQ-8: the presence of at least five of the eight PHQ-8 criteria 3. Minor and Major Depression	1. Minor Depression 2. Major Depression 3. Minor and Major Depression	1. Minor depression (age adjusted prevalence; men and women): a. Type 1 and Type 2: 8.3% b. Type 2 (use of insulin): 9.4% c.Type 2 (no insulin): 8.4% 2. Major depression: (age adjusted prevalence; men and women):	Yes: There was a ~25-fold difference in the rate of major depression among racial/ethnic subgroups: Non-Hispanic blacks and Asians had a lower rate of major depression than non-Hispanic whites (5.6% vs. 1.1%

		behaviours regarding leading causes of death among non-institutionalized US adults)	(combined scores)		a. Type 1 and Type 2: 8.3% b. Type 2 (use of insulin): 13.3% c. Type 2 (no insulin): 8.3% 3. Minor and Major Depression: a. Men and women (age adjusted): 16.6% b. Type 2 (use of insulin): 22.7% c. Type 2 (no insulin): 16.7% Gender disparity: women had a higher rate of minor and major depression than men (20.8% vs. 13.0%)	vs. 9.5%); American Indians/Alaska Natives had highest rate of major depression (27.8%).
Goldney, Philips, Fisher, & Wilson (2004)	Australia	3,010 men and women (aged 15 years or more) living in South Australa (5.2% had doctor-diagnosed diabetes	1. 'overall depression' (a collapsed estimated score which included the following depression categories: Major	1. 'overall' Depression 2. Major Depression 3. Minor Depression	1. overall Depression: a. people with diabetes:23.6% b. people without diabetes: 17.1% 2.Major Depression:	N/A Race/ethnicity information not presented

		(sample souce: data used in this study were obtained from the year 1998 South Australian Health Omnibus Survey- an annual population household survey- consisting of a representative population sample)	depressive disorder, dysthymia, mionor depressive disorder, and bipolar disorder) 2. Major Depression 3. Minor depression All depression categories assessed using the mood module of the Primary Care Evaluation of Mental Disorders questionnaire.		a. overall population: 6.8% 3. Minor Depression: a. overall population: 4.3% Gender disparity: female sex strongly associated with depression (note, low SES, and diabetes were also strongly associated with depression).	
Davies, Dempster & Malone (2006)	Belfast, UK	300 men and women (aged 16-91 years) with Type 1 or Type 2 diabetes (recruited from local General Practices and two hospital clinics in South and East Belfast)	HADS; cut-off score ≥ 8	Mild depressive symptoms	Men and women: 25%	N/A Race/ethnicity information not presented

Collins, Corcorant, & Perry (2009)	Ireland	1,456 men and women (aged 20 to 75 years) with Type 1 or Type 2 (*n* = 1,160; 80%) diabetes (selected from patients experiencing three different models of care in Ireland: (i) traditional mixed care; (ii) hospital/general practitioner (GP) shared care; (iii) structured GP care	HADS; 1. At least mild depressive symptoms (cut-off score ≥ 8)' 2. Mild depressive symptoms (score 8-10); 3. Moderate (score 11-14); 4. Severe (score 15-21)	1. at least Mild depressive symptoms 2. Mild depressive symptoms 3. Moderate depressive symptoms 4. Severe depressive symptoms	1. At least mild depressive symptoms: a. Men and women (Type 1 and Type 2): 22.4% b. Men (Type 2): 21.3% c. Women (Type 2): 24.1% 2. Mild (Type 2 population only): a. Men: 12.2% b. Women: 12.3% 3. Moderate (Type 2 population only): a. Men: 6.5% b. Women: 9.7% 4. Severe (Type 2 population only): a. Men: 2.6% b. Women: 2.1% Gender disparity: overall, more women than men T2DM more report mild to severe	N/A Race/ethnicity information not presented

					depressive sympotms	
Sotiropolous et al. (2008)	Greece	320 men and women (aged 35 to 70 years)with T2DM without overt macrovascular disease (recruited from patients attending the diabetes outpatient clinic located at the General Hospital of Nikaia)	Beck Depression Inventory (modified for diabetes patients); cut-off score ≥ 19	Elevated depressive symptoms	Men and women: 33.4% Men: 12.7% Women: 48.4% Gender disparity: More women with T2DM than men with T2DM reporting elevated depressive symptoms	N/A Race/ethnicity information not presented
Roupa et al. (2009)	Greece	310 men and women (56% were women; aged 20 years or more) with T2DM (participants recruited from diabetic medical centres of Attica basin)	HADS; cut-off score ≥ 8	Mild depressive symptoms	Men: 17.8% Women: 41.4% (4% increase in depression risk for every one BMI unit increase) Gender disparity: More women with T2DM than men with T2DM reporting at least mild depressive symptoms	N/A Race/ethnicity information not presented

Pouwer & Snoek (2001)	Netherlands	786 men and women (50.2% were women; mean age = 61.25 years) with T2DM [participants were either out-patients (n = 86), or patient members of the Dutch Diabetes Association (*n* = 700)]	HADS; cut-off score ≥ 11	Moderate to severe depressive symptoms	Men: 4-9% Women: 10-12% Gender disparity: More women with T2DM than men with T2DM reporting moderate to severe depressive symptoms	N/A Race/ethnicity information not presented

Note. *In the studies presented, the influence of diabetes-related health problems on depression prevalence is not explicitly stated; **In the studies presented, the race/ethnicity groups and the terms used correspond with the groups and terms used in each study.

Appendix F

Study 1 Demographic Information Form

VICTORIA UNIVERSITY | A NEW SCHOOL OF THOUGHT

DEMOGRAPHIC INFORMATION

Age (yrs):	**Weight**: _____(kg) or _____ (lbs)	**Height**: _____(cm) or _____(inches)
Where were you born?	**What is your first language?**	
Where were your parents born?		
What is your occupation (including retired, unemployed, home duties, student)**?**		

For the following questions, please tick the most relevant box:

1. a) Do you have responsibility for another person's care (e.g., husband, disabled child)**?** Yes ☐ No ☐

b) If yes, how often do you undertake your caring role? F/T ☐ P/T ☐

2. How long have you been diagnosed with Type 2 Diabetes (yrs)? 0-4 ☐ 5-9 ☐ 10-19 ☐ ≥20 ☐

3. Have you been diagnosed with one or more chronic illnesses other than diabetes? Yes ☐ No ☐

If Yes, Please Specify _____

_____

_____

4. a) Have you ever smoked? If so, for how long? Yes ☐ No ☐

b) Have you given up, ever? If so, for you long? Yes ☐ No ☐

5. Number of diabetes complications (e.g., Diabetic neuropathy, retinopathy, kidney disease, stroke, blindness)? 0 ☐ 1 ☐ ≥ 2 ☐

Please specify the complication/s: _____

6. How often do you experience:

a) Hypo-glycemic states (e.g. anxiety, irratibility, fatigue, sweating, shakiness)? daily ☐ weekly ☐ monthly ☐ never ☐

Please Specify _____

b) Hyper-glycemic states (e.g., frequently thirsty, hungry, and urinating, blurred vision)?

daily weekly monthly never

☐ ☐ ☐ ☐

Please Specify _____

7. How often do you:	daily	weekly	monthly	never
a) test you blood glucose levels?	☐	☐	☐	☐
b) eat a healthy, low fat diet?	☐	☐	☐	☐
c) use diabetes related medication?	☐	☐	☐	☐

If you use medication, please specify type:_____

8. Are there any other treatments and/or methods of control that you use to manage your diabetes and diabetes complications? Yes ☐ No ☐

If Yes, Please Specify _____

9. How often do you feel anxious about your:	daily	weekly	monthly	never
a) symptoms of diabetes	☐	☐	☐	☐
b) self-care/management of diabetes	☐	☐	☐	☐
c) visits to health professional (e.g., GP, dentist, podiatrist, optometrist)	☐	☐	☐	☐
d) Other (please specify):_____	☐	☐	☐	☐

Thank-you for your co-operation ☺

Appendix G

Hospital Anxiety and Depression Scale (HADS)

MOOD QUESTIONNAIRE

Below is a list of mood related feelings. Please indicate how often you have felt this way during the past week, by ticking the appropriate column below for each question (give only 1 answer per row). Don't take too long over your answers; your immediate reaction to each item will probably be more accurate than a long thought out response.

	most of the time	a lot of the time	occasionally	not at all
1. I feel tense or wound up				
	definitely as much	not quite as much	only a little	hardly at all
2. I still enjoy the things I used to enjoy				
	very definitely and quite badly	yes, but not too badly	a little, but it doesn't worry me	not at all
3. I get a sort of frightened feeling as if something awful is about to happen				
	as much as I always could	not quite so much now	definitely not so much now	not at all
4. I can laugh and as see the funny side of things				
	a great deal of the time	a lot of the time	from time to time, but not too often	only occasionally
5. worrying thoughts go through my mind				
	not at all	not often	sometimes	a lot
6. I feel cheerful				
	definitely	usually	not often	not at all
7. I can sit at ease and feel relaxed				
	nearly all the time	very often	sometimes	not at all
8. I feel as if I am slowed down				

Questionnaire continued on next page

	not at all	occasionally	quite often	very often
9. I get a sort of frightened feeling like butterflies in the stomach				
	definitely	I don't take so much care as I should	I may not take quite as much care	I take just as much care as ever
10. I have lost interest in my appearance				
	very much	quite a lot	not very much	not at all
11. I feel restless as if I have to be on the move				
	as much as ever	rather less than I used to	definitely less than before	hardly at all
12. I look forward with enjoyment to things				
	very often	quite often	not often	not at all
13. I get sudden feelings of panic				
	often	Sometimes	not often	very seldom
14. I can enjoy a good book or programme				

Thank-you for your co-operation ☺

Appendix H

Scottish Physical Activity Questionnaire (SPAQ)

PHYSICAL ACTIVITY QUESTIONNAIRE

The following questionnaire is a simple way of measuring the amount of physical activity you have done over the last week. The questionnaire is strictly confidential so try to answer all questions as honestly as you can. Obviously the overall accuracy depends on the accuracy of individual answers. It is not a test so there is no pass or fail.

REGULAR PHYSICAL ACTIVITY RELATES TO:

Exercise	e.g., weight training, aerobics etc. for 2-3 times per week; bushwalking for at least 2 hours once per week
OR	
Sport	e.g., golf, hockey, football, netball etc. for 2-3 times per week
OR	
General Activity	e.g., walking, gardening, etc. accumulating to at least 30 minutes, 4-5 times per week

(1)

Do you consider yourself to be regularly physically active now? YES ☐ NO ☐
(please tick one box)

If YES, go to question (2). If NO, were you regularly physically active,

3 months ago YES ☐ NO ☐

6 months ago YES ☐ NO ☐

Now go to question (2).

(2)

Please read through all categories listed below and tick ONE box for the category which best describes how physically active you have been over the last 6 months.

i) I am not regularly physically active and do not intend to be so in the next 6 months ☐

ii) I am not regularly physically active but am thinking about starting to be so in the next 6 months ☐

iii) I do some physical activity but not enough to meet the description of regular physical activity given above ☐

iv) I am regularly physically active but only began in the last 6 months ☐

v) I am regularly physically active and have been so for longer than 6 months ☐

(please tick one box)

On the following page you will find a sheet which lists your physical activity for the previous week

(3)

The following questions relate to your pysical activity over the **previous week**. Please try to think carefully and be as accurate as possible with your answers. For example, you may have spent 4 hours at the disco but actually only spent half the time dancing. Additionally be careful not to count the same activity twice. For example, if you have spent time in the last week bushwalking, be careful only to include this in either the walking or leisure section and not both.

In the past week, how many minutes did you spend each day?:

ACTIVITY	Monday	Tuesday	Wednes-day	Thursday	Friday	Saturday	Sunday	Total
Walking at work? e.g., walking up or down stairs, walking to and from your desk, “doing the rounds”, etc.								
Walking outside work? e.g., walking to the shops, walking your dog, walking to work, bushwalking, walking for pleasure, etc.								
Manual labour at work? Do include e.g., lifting, stacking shelves, climbing ladders, building work, etc. Do not include e.g., sitting at desk, answering telephone, driving check-out operation, etc.								
Manual labour outside work? Do include e.g., cutting grass, decorating, washing car, D.I.Y., digging, etc. Do not include e.g., weeding, planting, pruning, etc.								

Continued on next page

(3) cont.

ACTIVITY	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
Doing active housework? Do include e.g., vacuuming, scrubbing floors, bed making, hanging out washing, etc. Do not include e.g., sewing, dusting, washing dishes, preparing food, etc.								
Dancing? e.g., disco, line, country, etc.								
Cycling for pleasure or to work?								
Participating in a sport, leisure activity or training? Do include e.g., exercise classes, football, swimming, golf, jogging, athletics, etc. Do not include e.g., playing a musical instrument, fishing, darts, snooker/pool, etc.								
Other physical activity if not already covered (please write in)								

(4)

Was last week typical of the amount of physical activity you usually do? (tick one box and fill in spaces where appropriate)

YES ☐

NO – I usually do more ☐ Normally how much more _____(please indicate in minutes) Of which activity(s) _____

NO – I usually do less ☐ Normally how much less _____(please indicate in minutes) Of which activity(s) _____

(5)		
Are you currently employed?	YES ☐	NO ☐ (please tick one box)
If NO, end of questionnaire. If YES, have you changed your employment or the kind of work you do in the last month?	YES ☐	NO ☐ (please tick one box)
If NO, end of questionnaire. If YES, has this resulted in an increase in the amount of physical activity you do?	YES ☐	NO ☐ (please tick one box)
If NO, end of questionnaire. If YES, how and by how much?	_____(please indicate)	

END OF QUESTIONNAIRE – THANK YOU

Appendix I

Study 1 Supporting Letter

Baker IDI
HEART & DIABETES INSTITUTE

17 September 2009

Patients name
and address

Dear _____,

I have been approached by Professor Tony Morris and Melissa Moore of Victorian University who are commencing a Clinical Trial. This is a Study looking at women between the ages of 30 and 70 years with type 2 diabetes. I have agreed to supply them with a list of clients from our Institute who may be interested in participating. **Enclosed** you will find an explanation of the study and a questionnaire.

You are under no obligation to participate in this trial and please note that you will remain anonymous. None of your personal details have been provided to Victoria University.

If you have any questions or concerns regarding this please feel free to contact me directly or contact Professor Tony Morris or Melissa Moore on the numbers provided on the information sheet.

Many thanks for taking the time to read this information.

Yours sincerely

Dr _____
General Manger Diabetes Services
Baker IDI Heart and Diabetes Institute
FRACP
PN:

Telephone No:

Encls.

Baker IDI Heart and Diabetes Institute
250 Kooyong Road, Caulfield VIC 3162 Australia
T +61 3 9258 5050 **F** +61 3 9258 5090 **E** caulfield@bakeridi.edu.au **W** www.bakeridi.edu.au
PO Box 227, Caulfield South VIC 3162 Australia
ABN 98 131 762 948

Appendix J

General Practitioner/Practice Nurse Information Sheet

Dear Sir/Madam,

We, Professor Tony Morris and Melissa Moore, are presently conducting research, titled "**Adherence to Physical Activity among Overweight and Depressed Women with Type 2 Diabetes**". This research is part of my (Melissa) Doctor of Philosophy (PhD) in Exercise Psychology, at Victoria University, and Professor Tony Morris is my Principal Supervisor.

The prevalence of type 2 diabetes, overweight, depression and physical inactivity among Australians are rising rapidly (ABS, 2006). People with type 2 diabetes are more likely than those without diabetes to be overweight (ABS, 2006), depressed (Goldney et al., 2004), and physically inactive (ABS, 2006). This is worrying, because overweight, inactivity, and depression are all independent risk factors for each other. Additionally, overweight and inactivity are both major risk factors for type 2 diabetes, as well as many of the health problems associated with type 2 diabetes, such as coronary heart disease and cardiovascular symptoms (American Diabetes Association, 2007). Added to this problem, is the fact that depression is also an independent risk factor for health problems, such as coronary heart disease (ABS, 2006), and can worsen diabetic symptoms (Lustman & Clouse, 2002). Furthermore, people with both diabetes and depression have a significantly greater risk of death from all causes, compared to those with either diabetes or depression (Ege, Nietert, & Zheng, 2005; Zhang et al., 2005). Taken together, these findings suggest that people who are overweight, depressed, and have type 2 diabetes, are even less likely to participate in regular PA. Research has also shown the prevalence of depression and physical inactivity is greater among females than males (ABS, 2006). This also suggests that females are at even greater risk than males of overweight and type 2 diabetes. Clearly, reducing the prevalence of these modifiable health conditions (overweight, physical inactivity, depression) among females with type 2 diabetes is of upmost importance for the health system (e.g., Goldney et al., 2004).

The substantial physical and psychological health benefits of regular physical activity (PA) have been well documented. For example, regular participation in PA can substantially lower blood sugar level and improve diabetic management (Sigal et al., 2006), reduce the risk of morbidity and mortality (Warburton, Whitney, & Shannon, 2006), assist with weight reduction and weight maintenance

(Mcinnis, Franklin, & Rippe, 2003), enhance subjective well-being (Berger, 2004), and reduce depression (e.g., Babyak et al., 2000). Adherence to PA, however, particularly among females, diabetics, and those who are overweight, and/or depressed, continues to be a challenge for the health sector. Clearly, effective psychological interventions are needed that aim at increasing adherence to PA among overweight and depressed female adults with type 2 diabetes. To help in the development of such interventions, information about the link between PA and depression among overweight female adults with type 2 diabetes, is needed. Therefore, the purpose of this study (Study 1) is to measure PA levels and depression in overweight females with type 2 diabetes, to see whether there is a relationship between these two factors. For example, females who are more depressed, might participate in less PA than females who are more active. Consequently, in order to gain a thorough understanding of this association, we would like participants for Study 1 who cover the range of depression scores (e.g., from very low to pretty high), as well as a wide range of PA involvement (e.g., from sedentary to regularly activity).

We would greatly appreciate your assistance with data collection for Study 1, by handing out a questionnaire package (we have provided your surgery manager with the questionnaire packages), to eligible and interested patients. It is important to note that participation in this study is voluntary. Therefore, eligible patients should not be coerced in to participating in this study.

The questionnaire packs contain the following five materials, along with a reply paid envelope, which the participant will use to send us their completed measures.

1) *Plain language statement:* In this statement, we inform people what the study is about and what it involves, and invite them to participate

2) *Demographic form.* Demographic details will be obtained, including age, weight, height, and occupation.

3) *Center for Epidemiologic Studies Depression Scale (CES-D;* Radloff, 1977). The 20-item CES-D is a self-report measure that assesses the frequency of depressive symptoms during the last week. For every item, there are four possible responses, indicating the severity of the symptom. Specifically, each response is assigned a score ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Total CES-D scores range from 0-60, with high scores reflecting higher levels of depression. A cut-off score of 16 is most commonly used to classify people with significant depressive symptoms.

4) *The Scottish Physical Activity Quesionnaire (SPAQ;* Lowther, Mutrie, Loughlan, & McFarlane, 1999). The SPAQ consists of four questions, which assess participants' current stage of exercise behaviour change, and the time spent in occupational and leisure PA during the previous week (minutes per week of at least moderate intensity PA). The first three questions require a tick in the appropriate box response, and the fourth question requires an answer in a diary format.

5) *Participant contact details:* This form is only to be filled out by participants who would like to take part in Study 2. The participants' contact details will only be used as a means of getting in contact with the participant during the recruitment stage of Study 2 and Study 3, and will not be connected in any way to the participants.

Eligible participants for Study 1 must satisfy the following criteria:

-**Gender**: female

-**Age**: between 30 and 60 years of age

-**BMI status**: overweight (BMI equal to, or more than 25.00)

-**Health Status**: diagnosed type 2 diabetes, and no other diagnosed chronic disease, such as coronary heart disease. Physical activity must be considered safe and appropriate for the individual.

-**Main language spoken**: English

With your cooperation, we will be able to complete the first stage of our research. If you have any further questions or concerns about the research, the participant criteria, or your involvement in handing out the questionnaire packs, please feel free to contact us (our details are below).

Kind Regards,

Professor Tony Morris

phone: (03) xxxx xxxx
Email address:

Melissa Moore

phone: xxxx xxx xxx
Email address:

Should you have any concerns about the conduct of this research, please contact the Secretary, Human Research Ethics committee, Victoria University, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03- 9688 4710; fax no: 9678 2089

Appendix K

Study 1 Participant Information Sheet

STUDY 1

"Examining physical activity participation and mood among women with type 2 diabetes"

INFORMATION SHEET

Dear participant,

I (Melissa Moore) am currently conducting research on physical activity participation with Professor Tony Morris. This research is part of my studies for Doctor of Philosophy (PhD) in Exercise Psychology, at Victoria University, and Professor Tony Morris is my Principal Supervisor.

A health professional at your surgery has provided you with this questionnaire package, because you are the type of person we want involved in our research. More specifically, you are a female, with diagnosed type 2 diabetes, aged between 30 and 70 years.

Our research involves examining physical activity participation and mood among women with type 2 diabetes. This is an important topic that to date, has received little research attention.

We are currently recruiting participants for the first stage (Study 1) of our research. Participation in this study is voluntary. If you would like to participate, please complete the short physical activity measure, the mood measure, and the demographic information form that we have provided in this package, and mail all these forms to us in the reply paid envelope that we have also provided.

If you decide to participate, you will remain anonymous. That is, all of the questionnaires are number coded and only group data will be analysed and reported. Therefore, you will not be linked in any way to your responses, or referred to by name in the report.

Once the report of this study has been published, the information that you have provided will be stored for five years in a secure location at Victoria University. Professor Tony Morris will be responsible for the security of all confidential data collected in the course of the research. The people who will be granted access to the data are Melissa Moore and Professor Tony Morris. The reason for the access is for data analysis and interpretation after this study is completed. Upon request, you will also be granted access to the information that you have

provided. At the end of the five year time period, all confidential data collected in the course of the research study will shredded and disposed of.

RISKS AND SAFEGUARDS

Some of the questions asked in the physical activity and mood questionnaire may be associated with certain risks. For example, you may experience feelings such as anxiety or distress, either because of links with unpleasant experiences or because you are uncertain what the questions mean.

Remember, there are no right answers. The questionnaires are based on your experiences and how you feel. Also, you are free to withdraw your participation, simply by not returning the materials. Additionally, if you have completed and returned the materials, you are free to withdraw your participation at any stage during the research.

Please note, many people feel low, sad, or moody, every now and then. This does not mean that they have depression. Depression, is a serious illness, and is more than just a low mood. People who are depressed experience these feelings intensely, and for long periods of time.

Beyondblue is a national, independent, not-for-profit organisation working to address issues associated with depression, anxiety, and related substance misuse disorders in Australia. If you would like any more information on depression, please contact beyondblue (1300 22 4636), or visit their web site (www.beyondblue.org.au/). Additionally, Lifeline offers a 24-hour telephone counseling and suicide prevention service (phone 13114), and a web-site you can visit (www.lifeline.org.au/).

If you would like more information, or have and queries or concerns about this study, please contact us (our details are provided below), and we will be happy to answer your questions.

Kind regards

Professor Tony Morris
Phone: (03) xxxx xxxx
Email address:

Melissa Moore
Phone: xxxx xxx xxx
Email address:

Should you have any concerns about the conduct of this research, please contact the Secretary, Human Research Ethics Committee, Victoria University, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03- 9919 4710; fax no: 9678 208

Appendix L

Participant Contact Details for Study 2

EXPRESSION OF INTEREST TO PARTICIPATE IN ANOTHER STUDY

Dear Participant,

In the next few weeks, we will be conducting a further study (Study 2), to explore in greater detail, physical activity and mood among women with type 2 diabetes.

If you are interested in taking part in Study 2, please fill in your contact details on the next page. When we are recruiting participants for this study, we will send you further information about it. We will also contact you, to check whether you are still interested in participating. Please note that your details will remain confidential, and will not be linked in any way to the data you provide to the research.

Remember, you are free to withdraw your participation, at any stage during the research. Also, by providing your details, you are in no way obliged to carry through your expression of interest to participate in another study.

If you have any further questions or concerns regarding the research and/or your participation, please do not hesitate to contact us (our details are on the general information statement).

Kind regards

Professor Tony Morris Melissa Moore

EXPRESSION OF INTEREST TO PARTICIPATE IN ANOTHER STUDY

PARTICIPANT CONTACT DETAILS

Name: _____

Age: _____

Phone: (B) _____ (A) _____ (M)

Email: _____

Fax: _____

Best way to contact you (e.g, phone, email, or fax): _____

Best time/times to contact you:

In the box below, please indicate, using numbers (with the number "1" indicating the best time to contact you), the order of the 3 most suitable times for you to be contacted.

	Week-day	**Week-end**
Morning (9am-12pm)		
Mid-afternoon (12-3pm)		
Late-afternoon (3-6pm)		
Evening (6-8pm)		

Appendix M

Study 2 Interview Guide

Study 2 Interview Guide

Interview duration: ~30-45mins

1. Ice Breaker questions

- Broad questions designed to build rapport and help participant relax
- Examples: how has your day been so far? Did you have trouble finding the building?

Once introduction and 'house-keeping' information is complete, and participant appears relaxed, commence interview.

2. Explore the participants' barriers to and facilitators for PA

Note:

- During interview, be conscious not to overtire the participant. If participant appears anxious or restless, ask the participant if they are comfortable to continue with the interview
- Don't offer the examples which appear in [*italics*] unless participant does not understand or cannot answer the question.

Example of open-ended questions to ask:

Past/present PA:

- Tell me about your past PA behaviour? (i.e., activity level, pleasant/unpleasant experiences)
- How do you think your past PA experiences have affected your current PA behaviour?
- How would you describe your current PA level in relation to the recommended level of PA for health benefits (i.e., the accumulation of 30mins, most days of the week)?

Barriers to PA:

- In general, how does the thought of engaging in PA make you feel? *[e.g., does the thought of PA make you nervous, excited, anxious, relaxed]*
- Why do you think you have this reaction?
- Tell me about what you consider are your main barriers/obstacles for participating in PA? *[e.g., self-efficacy/fitness level/time constraints/social support/motivation]*
- What types of strategies (if any) do you use to overcome these barriers? *[e.g., social support, alternative activities, self-monitoring etc.]*

Facilitators for PA:

- What do you find drives you to engage in PA. That is, what are the main reasons why you participate in PA?
- Are there certain PA's that you enjoy more than others?
- How do you think your participation level would be, if you reduced your barriers/obstacles to participating in PA?

3. Follow-up questions
If participant has not clearly mentioned the influence of her depression (use the term **mood** instead of depression, unless participant has stated that she suffers from depression) on her PA participation, follow-up with questions specifically regarding how her depression has and does affect her PA:

- How do you feel your depression **(mood)** affects your current participation in PA?
- Have you always participated in low levels of activity? Do you feel that your depression **(mood)** prevented you from staying active or becoming active?
- Tell me about how you feel when you are physically active? [*e.g., reduced depression?]*

Once I am satisfied that I have obtained the relevant information, conclude the interview.

4. Conclusion:

- Thank participant for their participation
- Reassure confidentiality, and that she is free to contact myself (or Prof. Morris) at any stage, if she has any queries or concerns about the study, or her participation.
- Inform participant that I will be conducting another study (content of this study is not yet confirmed), and get an indication as to whether the participant might be interested in taking part in this next study.
- Debrief participants'

Appendix N

Study 2 Participant Information Sheet

"The motivations for, and barriers to, physical activity among women with type 2 diabetes"

INFORMATION SHEET

Dear participant,

We, Professor Tony Morris and Melissa Moore, are presently conducting research on physical activity participation. This research is part of my (Melissa) studies for Doctor of Philosophy (PhD) in Exercise Psychology, at Victoria University, and Professor Tony Morris is my Principal Supervisor.

Thank you for your expression of interest in this research. More specifically, we are examining physical activity participation among women with type 2 diabetes. This is an important topic that to date, has received little research attention.

If you are willing to participate, this study involves completing a short mood questionnaire and having a one-to-one interview with me (Melissa), discussing your past and present physical activity habits. I am particularly interested in what encourages you to, and what stops you from, participating in physical activity, and what types of activities you enjoy.

The interviews will be held at Victoria University, Footscray Park Campus, at a time that is convenient for you. We anticipate that the interview will last approximately 1 hour, and you would only attend one interview.

Please note that your details will remain confidential, and will not be linked in any way to the data you provide in our research. The interviews will be tape recorded, only for the purpose of data analysis. Only the researchers will listen to the taped interview. Also, the questionnaires are number coded, and your name will be kept separate from the code.

Participation in this study is voluntary, and you are in no way obliged to carry through with your expression of interest in participating in this study.

RISKS AND SAFEGUARDS:

Some of the questions asked in the mood questionnaire, and asking you to elaborate on issues concerning your physical activity, may be a sensitive topic for you. Consequently, you may experience short-term anxiety or negative moods.

Remember, there are no right or wrong answers, rather, the questionnaire and the interview are based on your experiences and how you feel. Also, you are free to withdraw your participation from the study at any stage during the research.

We will monitor, and ask you periodically throughout the interview, how you are feeling. If you appear upset or anxious, we will stop the interview temporarily. If you are still displaying anxious or upset feelings, we will stop the interview permanently. Also at the conclusion of the interview, we will debrief you.

If you would like to participate in this study, or would like more information, or have any queries or concerns about this study, please contact us (our details are provided below), and we will be happy to answer your questions. If you are willing, we will then arrange an interview time.

Kind Regards,

Professor Tony Morris
Phone: (03) xxxx xxxx
Email address:

Melissa Moore
Phone: xxxx xxx xxx
Email address:

Should you have any concerns about the conduct of this research, please contact the Secretary, Human Research Ethics Committee, Victoria University, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03- 9688 4710; fax no: 9678 2089

Appendix O

Study 2 Participant Consent Form

CONSENT FORM
FOR PARTICIPANTS
INVOLVED IN RESEARCH

"The motivations for, and barriers to, physical activity among women with type 2 diabetes"

INFORMATION TO PARTICIPANTS:
We would like to invite you to be a part of a study into the motivations for, and barriers to, participation in physical activity among women with type 2 diabetes.

Female participants will have diagnosed type 2 diabetes and be between the ages of 30 and 70 years.
The aim of this study is to use qualitative methods to explore how your moods affect your motivations for, barriers, and adherence to, participation in physical activity.

Participation in this study will involve completing a short mood measure and demographic information form, and then participating in a tape recorded, semi-structured interview (anticipated to go for about 60 minutes), exploring your motivations for, and barriers to physical activity.

There are minor risks associated with this study. In the unlikely event that you experience emotional discomfort while completing the short mood questionnaire, or during the course of the interview, we will ensure that your concerns are addressed, and you are free to withdraw from the study at any stage before, during, or after the interview.

Your information and identity will remain confidential, and your name will not be linked to the material provided during the study. Any information provided by you will be kept confidential, and will be stored on the University premises, following the procedures and secured in accordance with Victoria University guidelines

CERTIFICATION BY PARTICIPANT

I, (name) ……..of (suburb)
……..certify that I am at least 18 years old* and that I am voluntarily giving my consent to participate in the study:
"The motivations for, and barriers to physical activity among women with type 2 diabetes", being conducted at Victoria University by: Professor Tony Morris and Melissa Moore.

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 research, have been fully explained to me by: Professor Tony Morris and Melissa Moore and that I freely consent to participation involving these procedures:

- I will complete a 14-item questionnaire about my mood
- I will undertake a tape-recorded, semi-structured interview with the researcher (Melissa Moore), at Victoria University, Footscray Park campus. This interview will involve some personal information about me, including my gender and age, and a discussion about my physical activity habits, particularly my motivations for and barriers to physical activity
- At the conclusion of the interview, I will be debriefed.

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 s

Professor Tony Morris
Phone: (03) xxxx xxxx
Email address:

Melissa Moore
Phone: xxxx xxx xxx
Email address:

Should you have any concerns about the conduct of this research, please contact the Secretary, Human Research Ethics Committee, Victoria University, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03-9688 4710; fax no: 9678 2089

Appendix P

Physical Activity Log

By ticking the appropriate box, please indicate the time period (in this study) that your physical activity log refers to:

☐	Start of Study	☐	Week 12
☐	Week 3	☐	Week 15
☐	Week 6	☐	Week 19
☐	Week 9	☐	Week 23

Instructions for filling in your physical activity log:

For seven consecutive days, fill in one page at the end of each day. There is one page for each day of the week. Below is a list of physical activity examples that you may have performed during your day. For each activity you did that was more than 10 mins duration, and at least moderate intensity, write down the number of minutes you were actually moving. If you did an activity many times during the day, write down the total time you did that activity during the day. If you participated in other activities that are not listed, please include these activities as well. **Remember to record only the hours and/or minutes you were actively engaged in the activity.** Additionally, please describe how your mood and/or depression level was on that day, in the space provided in the bottom right corner of each page.

Defining moderate intensity activity:

Intensity is a subjective classification. Use the perceived rate of exertion scale (RPE) to help you determine
Intensity is a subjective classification. Use the rate of perceived exertion (RPE) scale to help
you determine whether the activities you participated in were at least moderate intensity
For example, a 5-6 RPE is equivalent to a brisk walk. At this intensity, you may be breathing a little harder than usual, but able to keep up a full conversation.
You do **not** need to record the intensity of the activities you participated in.

RPE scale

1-2: very light
3-4: light
5-6: moderate
7-8: heavy
9-10: very hard

Physical Activity Examples:

Home Activities:
Sweep, Scrub Floors, Vacuum,
Gardening or Yard Work
Washing clothes etc
Mowing the lawn (power mower)

Occupation
Walking at work
Farming, taking care of animals
stairs

Conditioning Activities
Aerobic exercise, aerobic dance
Bicycling, swimming, stepper
Jogging or running.
Walking for exercise (e.g., walking the dog)
Resistance training (weight training)

Sport Activities
Netball
Tennis
Volley-ball

Leisure Activities
Bowling
General Dancing
Yoga
Table tennis
Walking for pleasure or social

Transport
Bicycle to work, school, or shopping
Walk to work, school, or shopping Climbing

MONDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity	***Duration (Hrs Min)***
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____

2. How would you describe your mood today?

_____

_____

_____

_____

☐ *Please turn over the page for additional space*

TUESDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity	***Duration (Hrs Min)***
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____

2. How would you describe your mood today?

_____

_____

_____

_____

☐ *Please turn over the page for additional space*

WEDNESDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity	***Duration (Hrs Min)***
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____

2. How would you describe your mood today?

_____

_____

_____

_____

☐ *Please turn over the page for additional space*

THURSDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity	***Duration (Hrs Min)***
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____

2. How would you describe your mood today?

_____

_____

_____

_____

☐ *Please turn over the page for additional space*

FRIDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity	***Duration (Hrs Min)***
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____

2. How would you describe your mood today?

_____

_____

_____

_____

☐ *Please turn over the page for additional space*

SATURDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity	***Duration (Hrs Min)***
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____
_____	_____:_____

2. How would you describe your mood today?

_____

_____

_____

_____

☐ *Please turn over the page for additional space*

SUNDAY

Date: ____/____/_____

1. Please record the type and duration of the activities (that were at least moderate intensity (i.e., at least RPE 5). If you require additional space, please tick the box (bottom left corner), and continue your answer on the back of this page.

Physical Activity ***Duration (Hrs:Min)***

_____ _____:_____

_____ _____:_____

_____ _____:_____

_____ _____:_____

_____ _____:_____

2. How would you describe your mood today?

_____

_____

_____

3. Please describe any major changes that have occurred in your life over the past week (e.g., change in eating patterns, employment status etc.)

_____

_____

☐ *Please turn over the page for additional space*

Appendix Q

Lifestyle Physical Activity Manual for Participants

Lifestyle Physical Activity Consultation (LPAC) Manual

YOUR PERSONALISED PLAN

WHAT IS PHYSICAL ACTIVITY?

Physical activity is a broad term that includes all bodily movement produced by the skeletal muscles and results in energy expenditure. Therefore, *physical activity* covers all types of activity, such as exercise, sport, occupational, and lifestyle activities.

CURRENT PHYSICAL ACTIVITY RECOMMENDATIONS (FOR HEALTH BENEFITS)

Current physical activity recommendations focus on promoting active living, rather than a pre-determined exercise regime. More specifically, 'the accumulation of at least 30 min of moderate-intensity physical activity on most, preferably all days of the week, or at least 90 minutes a week of vigorous aerobic exercise' (Centers for Disease Control, and Prevention (CDC, 1996); American College of Sports Medicine (ACSM), 2007; and the National Physical Activity Guidelines for Australia (NPAGA)).

BENEFITS OF REGULAR PHYSICAL ACTIVITY

- Type 2 diabetes management
- Weight control
- Increased fitness & heart health
- Reduced risk of chronic diseases (e.g., Coronary Heart Disease)
- Joint and bone health, and reduced risk of osteoporosis
- Stress reduction
- Reduced anxiety and depression
- Improvement in overall mood and well-being
- Enhanced self-esteem / self-concept
- Socialising
- Time to oneself
- Plus many more!!! ……

AM I READY TO BEGIN & MAINTAIN AN ACTIVE LIFESTYLE?

My reasons for being more active	My reasons for not being more active

BECOMING MORE ACTIVE

Barriers	Ways to overcome Barriers
1.	*1.*
2.	*2.*
3	*3.*
4.	*4.*
5.	*5.*

MY ACTIVE LIVING PLAN

Activities you might consider:
1.
2.
3.

Planning what to do and where and when it will take place. Make first week goals within reach from where you are now. Two to three days with new activities is a good way to start. Think of taking at least 4 weeks to build up to the 30 minutes on most days of the week target

DAY	WHAT WHEN AND WHERE	√ WHEN YOU ACHIEVE
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		
Sunday		

MY GOALS

Date:

1 month	3 months	6 months
1.		
2.		
3.		

SUPPORT TEAM

Name	What things would you like them to do to help?

Triggers or risky situations that may cause a lapse in my physical activity	What can you do to prevent these lapses?

FOLLOW-UP PHONE CALLS SCHEDULE

FOLLOW-UP PHONE CALL1
(8 WEEKS POST-CONSULTATION)

- Date:
- Time:

FOLLOW-UP PHONE CALL 2
(12 WEEKS POST-CONSULTATION)

- Date:
- Time:

Appendix R

Guidelines for Lifestyle Physical Activity Consultation and Support Phone Calls

Study 3: Lifestyle Physical Activity Consultation (LPAC) and Two Support Phone Calls

Intervention Guidelines

Note: on the outset, it is important to highlight that the material provided below represents examples only. Also, PA consultations are delivered to clients using motivational interviewing (MI) techniques. More specifically, MI is a person-centered, non-directive method for enhancing motivation to change. Therefore, when using MI techniques, the practitioner guides the client to make decisions rather than advising/leading/directing the client, or imposing change (e.g., Miller & Rollnick, 2002).

LPAC INTERVENTION:
Aim: to develop an individualised lifestyle physical activity (PA) plan that will assist the adoption and maintenance of physical activity.

Duration: ~45-90mins
Intervention Delivery Notes[1]:

- Semi-structured
- Person centered (adapted to individual's needs)
- Guiding style (rather than directive). Avoid persuasion. Instead, encourage participant to take responsibility for their behaviour change. Allow them to explore and develop their own motivations and goals.
- Content of LPAC will be determined largely by participants' motivational status and needs. Therefore, strategies and format will vary from person to person.
- Assess participants' self-efficacy throughout the consultation

Examples of ways to enhance the participants' self-efficacy include:

- Telling the participants about other people (particularly overweight women with type 2 diabetes) who successfully engage in, and maintain a regular PA regimen;
- Praising participants for past PA attempts;
- Ensuring that the participants' PA plan is realistic and achievable, and allows for mastery experiences

Physical Activity Consultation Content[1]

1) What is physical activity (PA)?
a Inform participant of current amount of PA recommended for health benefits
b. Recommended level is consistent with recommendations for diabetes management

2) Ask (and if required, educate) the participant what physical activity is and different intensity levels
For example, ask participant:
a. to list some different types of physical activity
b. if they know the different levels of intensity, and intensity level required to achieve health benefits

3) Why be more active?
a. Ask participants what they consider to be the benefits of physical activity. If appropriate, educate participants on other physical and/or psychological benefits.

b. emphasise benefits regardless of weight loss:
- *reduced risk of cardiovascular disease; &*
- *reduced risk of all-cause mortality*

4) Decision balance
*Get the participants to recognise their pros and cons for increasing their physical activity. Guide them through this exercise (but don't **lead** them).*

5) Overcoming barriers
Get participants' to recognize potential barriers that may prevent them from becoming more active, and/or maintaining their regular PA participation. Then, get the participants to identify strategies they may be able to put in place to overcome these barriers. Guide them through this exercise.

Note: also go through the common barriers and facilitators that were identified by participants in Study 2

7) Go through current guidelines & discuss discrepancy between guidelines & participant's level of physical activity

Ask participants what they think/feel about their current level of PA in accordance to the guidelines that are recommended.

8) Identifying opportunities: *Get the participants to:*

- *write down activities that they will consider engaging in;&*
- *develop a weekly activity plan*

*Guide participants through this exercise, ensuring that t**h**eir plan is realistic and achievable.*

Emphasise that this isn't a set in stone plan. Rather, the purpose is to make them aware of where they could add PA into their daily life.

9) Develop long term goals
Get participant to identify and write down 1-month; 3-month; and 6-month goal/s.

Guide the participants through this exercise, ensuring that their goals are realistic and achievable.

10) Finding support

Get participant to identify what they need help with, in order to become more active, and maintain their regular PA behaviour.

Guide them through this exercise.

11) Relapse prevention: Maintaining behaviour change
Get the participants to identify triggers or risky situations that may cause a lapse in their PA

Then, get the participants to identify strategies to prevent these lapses.

Guide the participants through this exercise.

Concluding:

- check if participant has any other comments/remarks on any of the strategies discussed
- recap on what we covered during the consultation
- thank participant, and remind them that I will give them a call in 8 weeks time to touch base and see how they are going ☺
- set a tentative date for follow-up phone call
- give participant their pack of measures, and explain the procedure for filling in/returning their completed measures
- Ensure participant has a copy of the time line and associated dates

LPAC Support Phone Calls
(Weeks 8- & 12- Post LPAC)

Aims:

1. Reinforce strategies and content discussed in the LPAC;
2. Address any barriers to PA that the participant may be experiencing;
3. Enhance the likelihood that participants will maintain their increased level of PA; and
4. Reinforce the completion of the study measures (to minimise participant drop-out)

Duration: ~10-15mins (time may vary depending on participants' needs etc.)

Examples of open-ended questions to ask:

<u>1. To reinforce the strategies and content discussed in the LPAC:</u>

Self-efficacy:

- *How would you describe your confidence level, in terms of leading an active lifestyle?*

Goal setting

- *In what ways has goal-setting helped you to adopt and maintain an active lifestyle?*

Gradual increases in PA level:

- *How have you progressed, in terms of the total amount of PA that you are now achieving?*

Social support:

- *How do you feel your support (e.g., from family/friends/work colleagues) for initiating, and maintaining an increased PA level, has been? Have you joined any social clubs/walking groups etc?*

Relapse prevention:

- *Have you had to use your relapse prevention plan? (if so, why, and was it successful?)*

2. To address any barriers to PA that participants may be experiencing

- *Tell me about any problems that you have, or are experiencing in terms of becoming/staying more active?*
- *How successful have you found the strategies we developed to overcome these problems?*
- *What other strategies do you think may be more successful in helping you to overcome these problems?*
- *How do you find the integration of more PA into your daily routine?*

3. To enhance the likelihood that participants will maintain their increased level of PA

- *Tell me about the types of PA that you have enjoyed?*
- *How do you feel when you are more physically active?*

4. To reinforce the completion of the study measures and PA logs

- *Have you had any difficulties completing the questionnaires, and/or PA log?*
- *Just to remind you, the questionnaires need to be filled out and returned during the week of (insert dates), and the PA log also needs to be completed during this week. Remember to return the completed questionnaires and PA log at the end of these weeks.*

References

[1]Kirk, A., Barnett, J. & Mutrie, N. (2007). Physical activity consultation for people with type 2 diabetes. Evidence and guidelines. *Diabetes Medicine, 24,*809-816.

[2]Loughlan, C. & Mutrie, N. (1995). Conducting an exercise consultation: guidelines for health professionals. *Journal of the Institute of Health Education, 33,* 78-82.

Miller, W. & Rollnick, S. (2002). *Motivational Interviewing: Preparing People For Change (2nd ed.).* The Guilford Press: New York.

Appendix S

Study 3 Participant Information Sheet

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

You are invited to participate in a research project entitled "Monitoring physical activity participation and mood among women with type 2 diabetes".

This project is being conducted by a student researcher Melissa Moore as part of a PhD study at Victoria University under the supervision of Professor Tony Morris from the School of Sport and Exercise Science/Centre for Ageing Rehabilitation Exercise and Sport Science (CARES).

Project explanation

The aim of this study is to examine the effectiveness of an individualised intervention (a physical activity consultation) for increasing and maintaining physical activity behaviour. To do this, participants will take part in a one-to-one physical activity consultation with the researcher (Melissa), and two brief follow-up phone calls. To gain an in-depth knowledge of individuals perceptions of the experience of undertaking an individualised intervention to increase and maintain physical activity behaviour, and any resultant effects of physical activity participation on mood, participants will also take part in 3 phone interviews during the 6 month study.

What will I be asked to do?

- Attend a one-to-one physical activity (PA) consultation with the research student (Melissa Moore), which is anticipated to last for approximately 30-45 minutes;
- Participate in two brief follow-up phone calls (Week 8 and Week 12 after the consultation);
- Complete a short physical activity measure and a mood measure, about 2 weeks prior to the PA consultation, and four times after the consultation (Week 8, Week 12, Week 16, and Week 22). Additionally, you will be asked to complete a 7-day physical activity log (for 7-consecutive days) about 2 weeks prior to the PA consultation, and seven times after the consultation (Weeks 3, 6, 9, 12, 15, 19, and 23); and
- Participate in 3 semi-structured phone interviews with the research student (Melissa Moore). Each interview is anticipated to last 20-45 minutes.

What will I gain from participating?

There are numerous benefits expected from taking part in this study. These benefits include:

- Participating in an intervention that is designed to enhance your PA behaviour in a way that suits your needs, PA preference, and lifestyle.
- The anticipated increase in PA is likely to lead to many physical and psychological health benefits, including enhanced diabetes management..
- The results gained from this study will also benefit society at large, by informing health professionals on effective ways to assist their diabetic patients to better manage their diabetes.

How will the information I give be used?

The information you provide during the 3 semi-structured interviews will be combined with that given by other participants in this study. All of the information will be analysed collectively (using standard analysis

procedures), and you will not be linked in any way to the data you provide. We are interested in identifying the common themes and patterns associated with participants' experiences on the effects of the intervention on increasing or PA behaviour, and any psychological benefits that you have obtained as a result of your PA participation.
The information that you provide in the mood and physical activity measures will be used as additional measures, to monitor any changes in your mood and PA during the 6-months of this intervention.

What are the potential risks of participating in this project?

Some of the questions asked in the physical activity and mood questionnaire, or during the semi-structured interviews, may be associated with certain risks. For example, you may experience feelings such as anxiety or distress, either because of links with unpleasant experiences or because you are uncertain what the questions mean.
If you do experience feelings such as anxiety or distress, counselling will be available. Counselling will be conducted by a registered psychologist (Dr. Harriet Speed) who is not a researcher in this study. You have the option of contacting Dr. Harriet Speed directly, Ph: (03) 9919 XXXX, Email: _____
Remember, there are no right answers. The questionnaires and interviews are based on your experiences and how you feel. Also, you are free to withdraw your participation from this study, at any stage during the research without giving any reason.

How will this project be conducted?

Approximately two weeks prior to the intervention, participants will take part in a phone interview with the student researcher (Melissa), and will asked to complete and return the baseline measures (mood measure, physical activity measure, and consent form) which will be mailed to them (and will include a reply-paid envelope). The one-of intervention (physical activity consultation) will be conducted at Victoria University, and a convenient time for you. Eight and twelve weeks following the intervention, Melissa will phone you, to see how you are going with your physical activity plan, and to help you overcome any obstacles to physical activity participation that you may be experiencing. The remaining two phone interviews (with the aim of gaining an insight into your experiences of the effectiveness of the intervention in increasing your physical activity behaviour, and any mood benefits you've gained from your resultant increased physical activity) will be conducted 16 and 24 weeks following the physical activity intervention. The baseline measures will be mailed to you four times during the 6 months follow-up (in week 8, 12, 16, and 22), and you will be asked to promptly complete, and return these measures to the researcher in the included reply paid envelope. At eight times during the study (one week before the intervention, and then in week 3, 6, 9, 15, 19, and 23), participants will be asked to complete a physical activity log for 7 consecutive days, and to promptly return their completed log to the researcher. These logs will be given to the participants at relevant times during the study.

Who is conducting the study?

Victoria University, School of Sport and Exercise Science/Centre for Ageing Rehabilitation Exercise and Sport Science (CARES), Footscray Park, Melbourne

Principle Researcher:
Professor Tony Morris
Phone: 9919 xxxx
Mobile: xxxx xxx xxx
Email:_____

Student Researcher:
Melissa Moore
Mobile: xxxx xxx xxx
Email: _____

Any queries about your participation in this project may be directed to the Principal Researcher listed above.

If you have any queries or complaints about the way you have been treated, you may contact the Ethics and Biosafety Coordinator, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4148.

Appendix T

Study 3 Participant Consent Form

VICTORIA UNIVERSITY | A NEW SCHOOL OF THOUGHT

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

"Monitoring physical activity participation and mood among women with type 2 diabetes"

INFORMATION TO PARTICIPANTS:
We would like to invite you to be a part of a study that involves monitoring physical activity participation and mood, among women with type 2 diabetes.

The aim of this study is to examine in detail, physical activity habits and mood, in women with type 2 diabetes.

Female participants will have diagnosed type 2 diabetes, be between the ages of 30 and 70 years, and be individuals for whom physical activity is safe and appropriate.

Participation in this study will involve:

- Attending a one-to-one physical activity (PA) consultation with the research student(Melissa Moore), which is anticipated to last for approximately 30-45 minutes;
- Participating in two brief follow-up phone calls (Week 8 and Week 12 after the consultation);
- Completing a short physical activity measure and a mood measure, about 2 weeks prior to the PA consultation, and four times after the consultation (Week 8, Week 12, Week 16, and Week 22). Additionally, participants will be asked to complete a 7-day physical activity log (for 7-consecutive days) about 2 weeks prior to the PA consultation, and seven times after the consultation (Weeks 3, 6, 9, 12, 15, 19, and 23); and
- Participating in 3 semi-structured phone interviews with the research student (Melissa Moore). Each interview is anticipated to last 20-45 minutes.

There are minor risks associated with this study. In the unlikely event that participants experience emotional discomfort during the course of this study, the researchers will ensure that the participants' concerns are addressed and the participant s are free to withdraw from the study at any stage before, during, or after the intervention.

Also, If you do experience feelings such as anxiety or distress, counselling will be available. Counselling will be conducted by a register psychologist who is not a researcher in this study.

Your information and identity will remain confidential, and your name will not be linked to the material provided during the study. Any information provided by you will be kept confidential, and will be stored on the University premises, following the procedures and secured in accordance with Victoria University guidelines

CERTIFICATION BY SUBJECT

I, (name) ……of (suburb) ……..certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study:

"Monitoring physical activity participation and mood among women with type 2 diabetes", being conducted at Victoria University by: Professor Tony Morris and Melissa Moore.

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 research, have been fully explained to me by: Prof. Tony Morris and Melissa Moore, and that I freely consent to participation involving these procedures:

- Participate in a one-to-one physical activity (PA) consultation with the research student (Melissa Moore), at Victoria University, Footscray Park campus. The consultation will involve a discussion about my past and present activity levels, the types of physical activities that I enjoy and do not enjoy, and finding ways of accumulating physical activity in my daily lifestyle.
- Participate in two, brief follow-up phone calls (Week 8 and Week 12). These phone calls are an opportunity for the research student (Melissa Moore) to see how I am going in terms of implementing the strategies discussed in the consultation, and to help me overcome any difficulties I may be having in terms of increasing my physical activity level. Additionally, the follow-up calls provide the chance to resolve any problems I may be having in terms of completing and/or sending the questionnaire packages to the researchers.
- Participate in 3 semi-structured interviews: one approximately 2 weeks prior to the consultation, and two (Week 16, Week 24) after the consultation. The aim of the first interview to gain insight into my current physical activity behaviour, and mood. The aim of the second and third interviews is to gain insight on my personal experience of the intervention and its effects on my physical activity behaviour.
- Approximately 2 weeks before the consultation, I will complete baseline measures (a 14-item questionnaire about my mood; a 20-item physical activity measure), a physical activity log for 7 consecutive days, and a consent form.
- Following the consultation (Week 8, Week 12, Week 16, and Week 22), I will complete and return to the researchers (either via the internet or post) the mood measure, and the physical activity measure. Also, I will send (again, either via the internet or post) a completed 7-consecutive day PA log in Weeks 3, 6, 9, 12, 15, 19, and 23 –after the consultation.
- At the conclusion of the third interview (Week 24), I will be debriefed, and thanked for my participation in this study.

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 researchers

Professor Tony Morris
Phone: (03) 9919 xxxx
Email address: _____

Melissa Moore
Phone: xxxx xxx xxx
Email address:_____

Should you have any concerns about the conduct of this research, please contact the Secretary, Human Research Ethics Committee, Victoria University, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03-9688 4710; fax no: 9678 2089).

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Appendix U

Study 3 Interview One Guide

Study 3: Interview 1 Guide

NOTES FOR INTERVIEWER:
These guidelines are not specific because we want to gain an insight into the participant's current PA behavior, and psychological well-being. This information will be used as a comparison to the information obtained in the remaining two interviews. Of interest are the changes to the participants PA behaviour and resultant changes in mood state following the treatment.

INTERVIEW COMPONENTS:

1. Administration:
At the beginning of the interview I will:

- Make it clear to the participant, that the interviews are not a part of the treatment (PA consultation or follow-up phone calls). Rather, they are objective, and are purely intended to gain information. In other words, I will tell the participant that during these interviews, I will only be gathering information from them. I will not be providing any feedback, encouragement, or strategies to assist with any difficulties or barriers to PA they may be experiencing.
- Inform the participant that the main purpose of the first interview is to gather information about their current PA behavior and psychological well-being.
- If participants have not yet completed and/or returned their baseline measures and consent form, I will remind them to either post or email their completed forms ASAP (prior to their PA consultation).
- Schedule a time for the participants PA consultation.

1. General questions:
I will ask broad, open-ended questions to elicit participants' experience of two main themes in interest: Their current:

- PA behaviour; and
- Psychological well-being

2. Specific questions:
I will ask clarification probes to clarify anything that I did not understand, and elaboration probes to gain further insight on any interesting information the participant mentions, particularly information regarding the two main themes of interest

3. Conclusion:
At the end of the interview, I will:

- Thank the participant for their participation in the interview
- Remind participant about completing and returning the required baseline measures
- Reassure confidentiality (e.g. use of code numbers, analyzing data as a group)
- Schedule date for PA consultation

Appendix V

Study 3 Interview Two and Three Guides

Study 3: Interview Two and Three Guides

Structure of Each Interview

Start with general questions, and then get more specific (should move between the two fairly seamlessly)

1. General questions:

I will ask general questions at the beginning, unrelated to the specific themes. The aim of these questions are to 'break-the-ice', and ensure the participant feels comfortable and ready to talk about their experiences on the themes of interest.

Examples of questions:

a. How has your day been?

b. Are you enjoying this weather?

2. Specific questions:

I will:

- Ask broad, open-ended questions to elicit participants, experience of main themes in interest (see 'interview schedule' for each interview);
- Use prompts to clarify questions that the respondent has difficult initially understanding; and
- Use clarification probes to clarify anything that I did not understand, and elaboration probes to gain further insight on any interesting information the participant mentions, particularly information regarding the main themes of interest

3. Conclusion:

At the end of the interview, I will:

- Remind participant to complete and return the required PA and mood measures;
- Reassure confidentiality (e.g., use of code numbers, bogus name used in analysis);
- Interview two: Schedule next interview date
- Interview three: Thank participant for their participation, and debrief them

Interview Two Schedule

Theme 1: Impact of the Intervention on Participant's Short-Term PA Behaviour:

Examples of questions to ask participants:
1. Have your PA levels changed during the period from the initial consultation until now?

2. What do you think has affected your PA during this period?
- *Were there any particular aspects of the intervention (e.g. content/delivery) that you felt assisted you with your PA participation over the last 4 months?*

3. Is there anything else you would like to tell me (or you can tell me) about your PA levels over the last 4 months?

Theme 2: Effect of Participant's PA Level on Their Mood State:

(Clarification of the phrase 'ongoing mood': Our mood changes; it can go up or down from time to time, but we still have an impression of the typical level of our mood over a period of time. And this typical level can be referred to as our ongoing mood)

4. Has your ongoing mood changed (e.g., during the period from the initial consultation)?

5. What do you think has contributed to your mood change?

6. Is there anything else you would like to tell me (or you can tell me) about your mood over the last 4 months?

Theme 3: Effect of Participant's Mood State on Their PA Behavior:

N.B: Only ask questions related to this theme if participant's PA has changed, and if they haven't already provided answers these questions.

7. What has contributed to the change in your PA levels?

8. Is there anything else you would like to tell me (or you can tell me) about your experience over the last 4 months?

Interview Three Schedule

Theme 1: Impact of the Intervention on Participants' Long-Term PA Behaviour:

Examples of questions to ask participants:
1. Has your PA changed since the last interview (interview 2)?

2. What do you think has affected your PA during this period (between interview 2 and now)?

- *Were there any particular aspects of the intervention (e.g., content/delivery) that you felt assisted you with your PA participation over the last 6 months?*

- *Do you have any suggestions for how the intervention could be improved to assist you with your PA behaviour (e.g., delivery, strategies, time frame*)?

3. Is there anything else you would like to tell me (or you can tell me) about your PA over the last 6months?

Theme 2: Effect of Participants' PA Level on Their Mood State:

(Clarification of the phrase 'ongoing mood': Our mood changes; it can go up or down from time to time, but we still have an impression of the typical level of our mood over a period of time. And this typical level can be referred to as our ongoing mood)

4. Has your ongoing mood changed since Interview 2?

5. What do you think has affected your mood during this period?

6. Is there anything else you would like to tell me (or you can tell me) about your mood over the last 6 months?

Theme 3: Effect of Participants' Mood State on their PA Behaviour:

N.B: Only ask questions related to this theme if participant's PA has changed, and if they haven't already provided answers these questions.

7. What has contributed to the change in your PA?

8. Is there anything else you would like to tell me (or you can tell me) about your experience over the last 6 months?

Appendix W

Table of Master Themes: Physical activity and mood changes at Week 16

Table W5.16

Themes and Sub-Themes in Physical Activity (PA) Participation at Week 16

Theme	Sub theme	Indicative quotes*
Overall change in PA at week 16 since initial LPAC (3 sub themes)	Little/no short term change (8)	B 59-60, B 64-65, B 109-127, B 234-235, F 132-134, F 161-162, F 195-196, F 312-315, F 625
	Initial increase, but not sustained (5)	C 212-219, C 180-183, D 145-148, D 307-313, D 317-326,
	Increased and sustained at Week 16 post initial LPAC (5)	A 187, A 205-206, A 222-223, E 625-629,
Current PA amount at Week 16 since initial LPAC (2 sub themes)	Sedentary/Insufficient for health benefits (7)	B 26, B 30, B 43, C 212-219, D 145-148, D 307-313, D 317-326
	Regularly active, and continuing to increase (5)	A 187, A 205-206, A 222-223, E 625-629, F 195-196, F 625
PA barriers (8 sub themes)	Health problems (including associated pain) (16)	A 57-60, B 48-49, B 221-224, C 48, C52-60, C 64-66, C 96-98 C 180-183, C 99-201, C 381-388, D 224-226, E 140-141, E 220-223, E 227-234, F 205-209, F 219-222
	Low mood/depressive symptoms (19)	B 48-49, B 179-180, C 131, C 231-232, C 234-249, C 262, C 276-282, C 322-323, C 476, D182 D 186, D 152-152, D 161-164, D 258-259, D 291, D 307-313, D 423-430, D 448-449, D 453
	Tiredness (1)	A 57-60
	Lack of time/PA priority (4)	B 48-49, D 437-439, F 538-539, F 625
	Uncomfortable bike seat (1)	C 130-131
	Unfavourable gym conditions (limited opening hours, gym environment too busy) (3)	F 138-139, F 314-315, F 325
	Weather (too hot) (7)	F 2/42-43, F 166-167, F 208-209, F 215, F 220-

		221, F 488-490, F 549-556
	Other (work/family) commitments (5)	D 437-439, F 143-146, F 183-184, F 219-220, F 538-539
PA facilitators (8 sub themes)	Experienced physical health benefits of PA (9)	A 196, A 210-212, A 216-218, A 336-337, A 383-390, D 395-397, F189-190, F 226
	Experienced psychological health benefits of PA (11)	A 227-228, A 379, C 300-304, C 395-434, D 395-397, E 809-811, F 189-190, F 226, F 339-340, F 408-412, F 494-47
	Anticipated health improvement from PA (12)	A 331-332, A 341-342, A 351-352, A 363, B 118, B 127, B 59-160, C 206-208, C 393-393, D 234, F 152-153, F 189-190
	Increased PA and life direction (4)	E 240-242, E 736-741, E 748-752, E 850-851
	Upcoming holiday (5)	A 351-352, A 363, C 135, C 162-175, C 45-463
	Other people (grandkids, husband, socialise with old and/or new friends) (5)	C 143, C 162-175, C 450-463, D 248-250, E 639
	Weather (too cold) (4)	E 47, E 200-201, E 488, E 538
	Enjoyment of PA participation (8)	A 227-228, B 171-175, C 106-127, D 248-250, E 634-635, E 803-807, F 64, F 173-174
Reciprocal relationship between PA and mood (1 sub theme)	Experienced reciprocal inverse relationship between PA and mood (15)	A 192 , A 331-332, A 379, C 427-434, C 419-425, C 484-487, D 285-287, D 395-397, D 423-435, E 757-760, E 811, F 189-190, F226, F 408-412, F 494-497
Overall Impact of LPAC Intervention on health behaviour at Week 16 (4 sub themes)	Increased conscious awareness of health behaviour (diet, PA, blood glucose monitoring) (6)	A 423-424, A 430, B 74, B 109-110, B 143-144, B 234-235
	Little/no Influence on PA participation (5)	B 59-60, B 64-65, B 74, C 157-160, F 251
	Positive impact on PA behaviour: initial increase but not sustained	D 252-259, D 291, D 307-313, D 448-453

	at 16 weeks post-initial LPAC (4)	
	Positive impact on PA behaviour: increased and more regular at 16 weeks post-initial LPAC (7)	A187, A 205-206, A 222-223, E 287-288, E 259-262, E 644, E 764
Reported LPAC strategies and elements that had a positive impact on PA awareness and/or behaviour (5 sub themes)	PA education (2)	A 242-244, D 335-342
	Decisional Balance Strategy (1)	E 278-281
	Support phone calls (2)	D 335-342, E 73B
	Verbal support and encouragement (from researcher) (2)	A 242-244, C 436, 446
	Periodically completing self-report measures (7)	B 131-132, C 436-446, D 459-461, F 266-268, F 272-274, F 736, F 759-560
Overall change in self-reported mood at week 16 post initial LPAC (3 sub themes)	Negative mood change (2)	C 272, C 276-282
	Initial mood improvement, but deteriorated from 10 weeks post-initial LPAC (1)	D 367-369
	Improved mood (e.g. increased motivation, confidence, and feel better) (9)	A 192, A 259, A 291-292, A 379, B 201-211, B 234-235, B 239-240, E 433-435, E 428-435
Current mood at 16 weeks post- initial LPAC (2 sub themes)	Depressed/low mood (14)	B 79-81, C39-40, C 131, C 225-227, C 234-249, C 272, C 276-282, C 292-295, C 322-323, C 372, D 348-352, D 367-369, D 423-430, D 429-430
	Good and improving (6)	A 259, A 291-292, A 379, E 233-234, E 541-542, F 428-435

Note. *number represents interview two transcript line number, capital letter represents participant (A = Clare, B = Paula, C = Lucy, D = Dianne, E = Kelly, F = Mary). Data provided by participants in their returned self-report measures during this time period are not included in the Tables, only Week 16 interview data (quotations) are presented.

Appendix X

Table of Master Themes: Physical sctivity and mood changes at Week 24

Table X5.17

Themes and Sub-Themes in Physical Activity (PA) Participation at Week 24

Theme	Sub theme	Indicative quotes*
Overall change in PA at Week 24 (3 sub themes)	Decreased (5)	A 110, A 167-173, A 202-204, A 210-213, A 224-226
	Little/no change (10)	B2/53-54, B 78-84, B 95-102, B 104-108, B 621-622, D 198-200, F 86-86, F 108, F 118-119, F 453-454
	Increased (13)	C 30-32, C 43-44, C 88-92, E 6-7, E 11-15, E 34- 42, E 71-72, E126-134, E 139-140, E 150-152, E 156-157, E 163, E 493-501
Current PA amount at Week 24 (3 sub themes)	Minimal/insufficient for health benefits (7)	B 53-54, B78-84, B 95-102, B 104-108, B 621-622, D 5-6, D 15
	Low level (active lifestyle), but still not enough for health benefits (2)	A 167-173, A 210-213
	Active and continuing to increase PA amount (6)	C 123, C 129, E 19-22, E 55-56, E 64-66, E 163
PA barriers (4 sub themes)	Health problems (including associated pain) (11)	A 3/93-95, A 167-173, A 202-204, A 210-213, A 224-226, C 46-48, C 305-314, E 6-7, E 82-86, E 142-146, E 172-174
	Anxiety (about hearth rate increasing (1)	D 73-81
	Low mood/depressive symptoms (5) ,	B 113-116, B 126-128, B 590-595, D 57-61, D 236-241
	Weather (rain) (1)	F 112
	Other (work/family) commitments (3)	B 26-31, B 67-70, F 45-51

PA facilitators (8 sub themes)	Experienced physical health benefits of PA (5)	C 61-62, C 161, C 494, E 96-97, F 245-246
	Experienced psychological health benefits of PA (11)	C 27-28,C 61-62, C 165-166, C 370-373, C 494, E 96-97, E105-106, E 444-446 E 456, F 173-175, F 370-373
	Anticipated health improvement from PA (weight loss) (2)	F 220-221, F 260-265
	External Apparatus (walking frame) (2)	C 100, C 104-106
	Other people (grandkids, husband, socialise with old and/or new friends, group exercise instructor) (6)	C 61-62, C 1880192, C 444-446, C 459-467, C 485-489, D 33-43
	Role Models (2)	C 471-473, C 477
	Weather (too cold) (2)	F 197-201, F 231-232
	, Enjoyment of PA participation (2)	C 68-72, E 88-92
	Positive past exercise experience (1)	E 110-113
	Optimistic Attitude (desire to continue increasing PA) (6)	C 435-440, E 150-152, E 156-157, E 493-501, F 112-119, F 232
	Exercise self-efficacy (3)	C 81, C 417-423, C 435-440
	Internal health locus of control (1)	F 370-373
Reciprocal relationship between PA and mood (3 sub themes)	Experienced reciprocal relationship between increased PA and enhanced mood (15)	B 333-337, C 27-28, C 241-248, C 297-301, C 329-340, C 370-373,E 105-106, E 150-152, E 156-157, E 444-446, E 493-501, E 456, F 173-175, F 236-237, F 357-365

	Experienced reciprocal relationship between reduced PA and reduced mood (4)	B 26, B 30-31, B 113-116, D 236-241
	No reciprocal relationship experienced since week 16 post-LPAC (1)	A 468
Overall Impact of LPAC on health behaviour at Week 24 (3 sub themes)	Increased conscious awareness of health behaviour (diet, PA, blood glucose monitoring) (5)	B 58-59, B 345-347, B 408, D 340-342, D 348-357
	Little/no Influence on PA participation (5)	B 58-59, B 345-347, B 408, D 340-342, D 348-357
	Positive impact on PA behaviour: increased and more regular at 24 weeks post initial LPAC (18)	A 236-241, A 509-514, A 522-523, C 184, C 503-507, C 520-529, E 215-217, E 221-222, E 226-227, E 231-232, E 488-493, E 508-515, E 524-525, E 626-630, E 635-650, E 654-656, F 155-157, F 197-201
Reported LPAC strategies and elements that had a positive impact on PA awareness and/or behaviour (5 sub themes)	Goal setting (1)	C 233-239
	Follow-up phone calls (3)	B 345-347, B 351, D 348-357, E 221-222
	Verbal support and encouragement (from researcher) (2)	A 236-241, E 221-222
	Periodically completing self-report measures (10)	A 509, A 513-514, A 522-523, B 345-347, B 351, C 180, C 511-512, D 348-357, E 215-217, E 221-222
Reported LPAC strategies that had a negative impact on mood (1 sub theme)	Periodically completing self-report measures (1)	D 361-376

Theme	Sub theme	Indicative quotes*
Overall change in self-reported mood at Week 24 (2 sub themes)	Negative mood change (10)	B 26, B 30-31,B 120-123, B 126-128, B 138, B 295-299, B 642, B

		701, D 61, D236-241
	Improved mood (17)	A 365-366, A 370-371, C 287-289, C 297-301, C 342-358, C 417-423, C 435-440, D 203, D 208, D 314-325, E 298, E 302-304, E 324-330, F 225-226, F 274-275, F 354-355, F 403-404
Current mood at Week 24 (2 sub themes)	Depressed/low mood, but optimistic of mood improvement (4)	B26: 30-31, B 126-128, B 295-299, B 303-309, B 627-630, B 670-684
	Good and improving (6)	A 426-431, C 342-358, C 385, D 330-335, E 386-393, E 635-650, F 173, F 188-191, F 426-429

Note. *number represents interview three transcript line number, capital letter represents participant (A = Clare, B = Paula, C = Lucy, D = Dianne, E = Kelly, F = Mary). Data provided by participants in their returned self-report measures during this time period are not included in the Tables, only Week 24 interview data (quotations) are presented.