

**ADHERENCE TO PHYSICAL ACTIVITY FOR ADULTS WITH DEPRESSION:
THE ROLE OF THE NURSE PRACTITIONER –
AN INTEGRATIVE LITERATURE REVIEW**

by

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ABSTRACT

Depression is a significant problem for Canadians, as is the declining overall health of adults due to sedentary lifestyles. The purpose of this integrative literature review is to examine how nurse practitioners, providing primary health care in Canada, can facilitate adherence to physical activity for adults with mild to moderate depression. Background knowledge of depression, physical activity and adherence is presented along with an overview of primary health care. A Medline search collected 15 research articles for analysis. Key findings included reduced adherence to exercise for adults with depression, positive effects on mood from moderate intensity exercise, health promotion challenges within primary care, and interdisciplinary approaches to improving adherence. Recommendations are presented using the 5A's approach and include the application of psychological theories, assessment of readiness for exercise, individualized exercise prescription targeting public health guidelines, enlisting social supports, frequent follow-up, along with additional education to practitioners.

Keywords: adherence, behaviour change, compliance, depression, exercise, family practice, health promotion, nurse practitioner, physical activity, primary care, primary health care

TABLE OF CONTENTS

| | | |
|-----------------------|---|-----------|
| Abstract..... | | ii |
| List of Tables..... | | v |
| Acknowledgements..... | | vi |
| Chapter 1 | Introduction..... | 1 |
| | Background..... | 3 |
| | Depressive Disorders..... | 4 |
| | <i>Pathophysiology</i> | 5 |
| | <i>Management of depression</i> | 7 |
| | Exercise and Depression..... | 7 |
| | Physical Activity..... | 10 |
| | <i>Physical activity: the concept</i> | 10 |
| | <i>Physical activity guidelines</i> | 11 |
| | <i>Assessing readiness for exercise</i> | 12 |
| | Adherence..... | 14 |
| | <i>Adherence: The concept</i> | 15 |
| | Primary Health Care and the Nurse Practitioner..... | 16 |
| Chapter 2 | Methods..... | 20 |
| | Stage I: Conceptualisation and Search Strategy..... | 20 |
| | Stage II: Preliminary Search..... | 22 |
| | Stage III: Focused Search..... | 23 |
| | Stage IV: Analysis and Reporting..... | 23 |
| Chapter 3 | Findings..... | 25 |
| | Links between Depression, Exercise, and Mood..... | 25 |
| | Key Psychosocial Elements for Physical Activity Adherence..... | 29 |
| | Provider Perceptions and Practices..... | 33 |
| | Targeted Physical Activity Promotion Strategies..... | 36 |
| | Physical Activity Counselling Approaches..... | 40 |
| Chapter 4 | Discussion..... | 48 |
| | Promoting Physical Activity for those with Mild to Moderate Depression: An Important Clinical Issue..... | 48 |
| | Facilitating Adherence to Physical Activity: Practical Approaches.... | 50 |
| | <i>Counselling techniques</i> | 50 |
| | <i>Exercise prescription</i> | 53 |
| | <i>The social factor</i> | 56 |
| | Practice Considerations for Primary Care..... | 57 |
| | Recommendations..... | 59 |
| | Recommendations for Practice..... | 59 |
| | Recommendations for Education..... | 61 |

| | |
|--|----|
| Recommendations for Research..... | 62 |
| Limitations..... | 63 |
| Conclusion..... | 64 |
| Glossary..... | 66 |
| References..... | 73 |
| Appendix I Counselling Models | 84 |
| Appendix II Linking Motivation, Self-Efficacy and Intention..... | 85 |
| Strategies for Practice to Facilitate Exercise Adherence | |
| Appendix III The Transtheoretical Model..... | 86 |
| Appendix IV Assessing Readiness for Exercise and Exercise Planning | 87 |
| Appendix V The 5A's Approach: How nurse practitioners in Canada can facilitate adherence to physical activity for adults with mild to moderate depression through primary health care..... | 89 |

LIST OF TABLES

| | |
|---|----|
| Table 1 <i>Eligibility criteria for literature review inclusion in the findings</i> | 21 |
| Table 2 <i>Search terms for the literature review</i> | 22 |
| Table 3 <i>How nurse practitioners in Canada can facilitate adherence to physical activity for adults with mild to moderate depression through primary health care: the 5A's approach</i> | 59 |

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CHAPTER 1

Introduction

A significant number of Canadians are afflicted with mood disorders. About 11 percent of men and 16 percent of women in Canada will experience major depression in the course of their lives (Health Canada, 2009). Depression can limit quality of life, affect relationships, lead to lost time from work or school, contribute to other chronic diseases, and too often leads to suicide. The World Health Organization (WHO) has ranked depression fourth among the ten leading causes of the global burden of disease, and predicted that it will jump to second place by the year 2020 (WHO, 2001). Mental illness contributes to a significant economic burden in Canada, totalling 51 billion dollars in 2003 (Lim, Jacobs, Ohinmaa, Schopflocher & Dewa, 2008). This total incorporates the use of medical resources and productivity losses due to long-term and short-term disability, as well as reductions in health-related quality of life.

In addition to the problems that are inherent with the experience of depression itself, depressed adults also don't get enough exercise. An American survey from 2006 found that depressed adults were less physically active than non-depressed adults (Song, Lee, Baek & Miller, 2011). A lack of physical activity is contributing to poorer physical and mental health outcomes for adults with depression, and the health of the population at large is compromised by sedentary lifestyles. Physical inactivity has been identified by the WHO as the fourth leading risk factor for global mortality (WHO, 2010). The majority of Canadians today spend most of their waking hours in sedentary pursuits. Only about 15 percent of Canadian adults meet the current physical activity guidelines, with a larger proportion of men (17%) meeting the guidelines than women (14%) (Statistics Canada, 2011). Sedentary behaviour is

increasing in many countries with major implications for the prevalence of non-communicable diseases and the general health of the population worldwide.

A problem contributing to sedentary behaviour is non-adherence to health recommendations for physical activity. Research has shown that across a variety of settings almost half of medical patients in the United States do not adhere to physician recommendations for prevention or treatment of acute or chronic conditions, including not taking medication correctly, forgetting or refusing to follow a diet, not engaging in prescribed exercise, not attending appointments, and persisting in lifestyles that endanger their health (DiMatteo, Lepper & Croghan, 2000). Patients with depression are at greater risk of non-adherence. Compared with non-depressed patients, the odds are three times greater that depressed patients will be non-adherent with treatment recommendations (DiMatteo, et al., 2000). The problem then, as shown by the research, is that not only are depressed adults less active, they are less adherent to recommendations to be active.

Since depression is linked to decreased adherence to physical activity, this poses a significant problem for the patient with depression, as well as for the health care provider. Depressed adults therefore require extra attention for exercise promotion in effort to maximize potential health benefits. The goal of this project is to answer the question, 'How can the nurse practitioner facilitate adherence to physical activity for adults with mild to moderate depression in the context of primary health care within Canada?' This study focuses on adults aged 20-65 diagnosed with mild to moderate depression, as this was the most common age range in selected adult studies. This project does not target severe depression because the goal is stabilization of a condition and the research supports exercise as a treatment modality for mild to moderate depression but management for severe

depression is more complex and requires a different approach. To answer the research question, an integrative review of the research literature was undertaken. Prior to answering the research question, a discussion of the relevant background literature will be provided to identify the significance of physical inactivity in this population, leading to a linkage of the research concepts. This background will outline the significance of depression, the purpose of physical activity, the role of adherence, and the potential for impact within primary health care (PHC). The background is followed by project methods, findings from literature analysis, discussion of findings, and recommendations for clinical practice and education. The outcome of this integrative literature review is a set of recommendations that could be incorporated into clinical practice to improve adherence to physical activity, which may ultimately improve both life expectancy and quality of life for adults with depression. These recommendations will be useful to both the nurse practitioner (NP) and other health professionals within the context of primary health care.

Background

Physical inactivity is a major public health issue and contributes significantly to rising chronic disease (Warburton, Nicol & Bredin, 2006). This is particularly pertinent in those with mental health conditions. Depression results in less engagement in physical activity, and in turn, poorer outcomes in mental health as well as overall wellbeing. An American study found that 12 percent of depression-related health care claims were attributable to physical inactivity (Garrett, Brasure, Schmitz, Schultz, & Huber, 2004). The following sections of this chapter will identify the significance of depression, the pathophysiological linkages between exercise and depression, the importance of exercise, the concept of adherence, primary health care and the nurse practitioner.

Depressive Disorders

Depression is a persistent state of low mood. Depressive disorders are categorized in the DSM-IV (APA, 2000) under “Mood Disorders”, and include Major Depressive Disorder (MDD), Dysthymic Disorder, or Depressive Disorder Not Otherwise Specified. The American Psychiatric Association (APA) has recently published the DSM-V (APA, 2013), with updates included to depressive disorders, however currently available research would have applied the DSM-IV (APA, 2000) criteria. The criteria of major depressive disorder and its various severities have not been altered in the DSM-V to a significance that would affect the application of recommendations from this project. Major Depressive Disorder is characterized by one or more Major Depressive episodes. A Major Depressive Episode is a period of at least 2 weeks during which there is either depressed mood or the loss of interest or pleasure in nearly all activities, accompanied by at least four additional symptoms from a list that includes changes in appetite or weight, sleep, and psychomotor activity; decreased energy; feelings of worthlessness or guilt; difficulty thinking, concentrating, or making decisions; or recurrent thoughts of suicidal ideation, plans or attempts (APA, 2000).

Depression is further categorized as mild, moderate or severe. Severity is based on the number of criteria symptoms, the severity of symptoms, and the degree of functional disability and distress. Mild episodes are characterized by the presence of only five or six depressive symptoms and either mild disability or the capacity to function normally but with substantial and unusual effort. Severe episodes include most of the criteria symptoms along with clear and observable disability. Moderate episodes have a severity that is intermediate between mild and severe (APA, 2000). This project will focus on mild to moderate depression.

Many factors contribute to the development of major depression. An individual may be genetically predisposed to depression, and his or her risk can be increased by several external factors, such as the death or illness of a loved one, difficulty at work or with a personal relationship, low self-esteem financial difficulties, or addictions (Health Canada, 2009). Depression affects thoughts and feelings and may manifest with physical symptoms as well. Depression is associated without causal link to multiple comorbidities, including brain disorders related to neurodegeneration such as Alzheimer's, Parkinson's, Huntington's disease, multiple sclerosis and stroke; medical disorders such as cardiovascular disorders, chronic fatigue syndrome, chronic obstructive pulmonary disease, rheumatoid arthritis, psoriasis, systemic lupus erythematosus, inflammatory bowel disease, irritable bowel syndrome, leaky gut, diabetes type 1 and 2, obesity and metabolic syndrome, and HIV infection; and conditions, such as haemodialysis, interferon- α -based immunotherapy, the postnatal period and psychosocial stressors (Maes, Kubera, Obuchowiczwa, Goehler & Brzeszcz, 2011).

Pathophysiology. The pathophysiology behind depressive disorders is not well understood but follows a number of theories with varying support from existing evidence (Hasler, 2010). Deficiency of monoamines, especially serotonin, norepinephrine and dopamine, has been a rational hypothesis for MDD since almost every drug that inhibits monoamine reuptake has antidepressant properties, but monoamine deficiency is likely a secondary downstream effect of other more primary abnormalities. Solid evidence from twin studies suggest that 30 to 40 percent of MDD risk is genetic, but no specific depression risk gene or gene-environment interaction has been reliably identified. Non-genetic factors explaining the remaining incidences of MDD are individual-specific environmental effects,

such as adverse events or ongoing stress, including childhood sexual abuse, other lifetime trauma, low social support, marital problems and divorce. The HPA (hypothalamic-pituitary-adrenal) axis is responsible for releasing the stress hormone cortisol into the bloodstream. Altered HPA axis activity is a plausible explanation for early and recent stress as risk factor for MDD, but there have been no consistent antidepressant effects of drugs targeting the HPA axis. (Hasler, 2010).

Hasler (2010) reviewed the evidence for a number of other potential explanations for the aetiologies of depression. Dysfunction of brain regions has been suggested since stimulation of specific regions can produce antidepressant effects, but conclusive results from neuroimaging are limited in the literature for explaining MDD. Neurotoxic and neurotrophic processes are plausible explanations of brain volume loss during the course of depressive illness, though there has been no evidence from humans for specific neurobiological mechanisms. The theory of reduced GABAergic activity has been shown from converging evidence in magnetic resonance spectroscopy and post-mortem studies, but here again there have been no consistent antidepressant effect of drugs targeting the GABA (gamma-aminobutyric acid) system. Dysregulation of the glutamate system has been suggested as a process in MDD since drugs targeting the glutamate system have potentially rapid and robust effects on depression, though with questionable specificity, since glutamate is involved in almost every brain activity. Manipulation of circadian rhythms such as sleep deprivation can have antidepressant efficacy, but there is no molecular understanding of the link between circadian rhythm disturbances and depression. From this review it is evident that depression is a complex disorder with a number of potential contributing factors to the pathophysiology.

Management of depression. Depressive disorders are generally diagnosed by a primary care practitioner or a psychiatrist. A family or adult NP diagnoses and manages depression independently, and like other care providers, consults or refers as appropriate (CRNBC, 2011b). Treatment of depression is variable depending on the individual and resources available. Common treatment includes psychological counselling combined with anti-depressant medication. Anti-depressant drugs, as mentioned, primarily focus on inhibiting monoamine reuptake. Exercise is effective in preventing and treating depression by the way that it changes endorphin and monoamine levels and reduces cortisol (Rimer et al., 2012). Support from family and peers and self-help groups can also be paramount in coping with and recovering from depression. Exercise and social contact play a role in improving self-esteem, which is a predictor of perceived well-being (Rimer et al., 2012). Through this intervention involving social supports, there is an opportunity to improve physical activity as well and in turn improve the outcomes from depression. Within its jurisdiction, the Government of Canada works to support research and its dissemination, strengthen the capacity of the primary health care, home care and acute care sectors to effectively deliver mental health programs and services, raise awareness through social marketing campaigns, conduct surveillance on mental health trends in the population (Health Canada, 2009). An important and under-emphasized management tactic for depression is physical activity, which is behind the purpose of this project.

Exercise and Depression

Physical activity has the potential to reduce the negative impact of depression on individuals and society as a whole. Physical activity has a long history of association with lower incidence of depression and depressed mood (Dunn, Trivedi & O'Neal, 2001;

Martinsen, 2008; Rimer et al., 2012). There is growing evidence that physically active people are at a reduced risk of developing depression, and that exercise interventions are associated with significant benefits for patients with mild to moderate forms of depression as well as in reducing anxiety (Martinsen, 2008). Exercise is indicated for the management of depression, according to an array of research. Exercise seems to improve depressive symptoms in people with a diagnosis of depression when compared to no treatment or control intervention, especially within the mild to moderate range (Rimer et al., 2012; Josefsson, Lindwall & Archer, 2013; Silveria et al., 2013). A need for more conclusive research has been identified in the study of how exercise affects depression, particularly over the long term (Krogh, Nordentoft, Sterne & Lawlor, 2011).

Exercise has antidepressant effects at a number of levels. Biochemically, exercise beneficially modifies the HPA axis and reduces circulating cortisol; it amplifies circulating endorphins, the endogenous opioid transmitters, it increases the endogenous cannabinoid neurotransmitter anandamide, it increases monoamines by increasing the expression of 5-Hydroxytryptophan (5-HTP) which is decarboxylated to serotonin (5-HT); and exercise increases circulating levels of testosterone, which may have a protective effect against depression (Rimer et al., 2012; Sarris, 2011). Physiologically, exercise increases cerebral blood flow and stimulates the growth of new nerve cells (Rimer et al., 2012; Sarris, 2011). From a psychological perspective, exercise may act as a diversion from negative thoughts, as well as an avenue for social contact, and it increases self-efficacy, which increases self-esteem and is linked to subjective well-being (Rimer et al., 2012). A great number of physical activities provide social exposure, which contribute to reducing depression through the effect of exercise itself combined with socialization. A bonus from exercise is the

potential for time spent outdoors, especially since research has shown that time spent outdoors has been associated with greater vitality, that is, better physical and mental energy (Ryan et al., 2010). A healthy level of physical activity has been linked to preventing numerous chronic conditions, as well as being paramount in weight control.

Perhaps most significant for predicting morbidity and mortality, there has been confirmation through meta-analysis of a reciprocal link between depression and obesity. Obesity was found to increase the risk of depression, and depression was found to be predictive of developing obesity (Luppino et al., 2010). Major depressive disorder is associated with an elevated risk of numerous metabolic disturbances, including obesity, metabolic syndrome, insulin-dependent diabetes mellitus type II, and death after myocardial infarction (Lutter & Elmquist, 2009). The frequency of co-occurrence of depression and obesity suggests interconnected pathophysiology. Biological mechanisms that are most likely involved include abnormalities in metabolic networks broadly defined as glucose-insulin homeostasis, inflammatory processes, glucocorticoid signaling, oxidative stress, autonomic dysregulation, and energy biosynthesis (McIntyre et al., 2009). Unequivocal evidence indicates that obesity and mood disorders are chronic low-grade pro-inflammatory states that result in a gradual accumulation of allostatic load (Soczynska et al., 2011). Disturbances of mood may alter peripheral signaling pathways that regulate metabolic processes, including those involving leptin and ghrelin (Lutter & Elmquist, 2009). The interaction between depressive disorders and obesity further emphasizes the importance of physical activity for depression (McElroy et al., 2004). Whether obesity contributes to depression or vice versa, decreasing one may decrease the other, and physical activity can play a role in improving both. The use of exercise for the management of obesity is a broad topic in research but

beyond the scope of this project. Exercise, in combination with adjunct treatments such as cognitive behavioural therapy and pharmacotherapy, may be an appropriate treatment approach for patients with depression (Craft & Perna, 2004; Daley, 2008). The following section will further highlight the importance of exercise to overall health.

Physical Activity

Regular physical activity is critical to physical and emotional wellbeing. Physical activity has been shown to have substantial health benefits in the realms of prevention and management of chronic disease. In a review by Warburton et al. (2006), it was confirmed that there is irrefutable evidence of the effectiveness of regular physical activity in the primary and secondary prevention of chronic disease, including cardiovascular disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis, as well as premature death. The most physically active people have the lowest incidences of these chronic diseases, and the greatest improvements in health status are seen when sedentary people become physically active (Warburton et al., 2006). This review also revealed that the Health Canada physical activity guidelines are sufficient to elicit health benefits, especially in previously sedentary people. Benefits from physical activity have also been found for arthritis, erectile dysfunction, chronic fatigue syndrome, lower-back pain, and chronic obstructive pulmonary disease (Penedo & Dahn, 2005). Beyond impacting morbidity and mortality, exercise positively affects a variety of health outcomes. Studies have shown physical activity to be associated with improved quality of life, better functional capacity, and better mood (Peluso & Guerra de Andrade, 2005; Penedo & Dahn, 2005).

Physical activity: the concept. The terms “physical activity” and “exercise” are often used synonymously or interchangeably in the literature, though they differ slightly. “Physical

activity," "exercise," and "physical fitness" are terms that describe different concepts, as clarified in a concept analysis by Caspersen, Powell and Christenson (1985). Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure, and can be categorized in daily life into occupational, sports, conditioning, household, or other activities. Exercise is a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness. Physical fitness is a set of attributes that are either health- or skill-related, and the degree to which people have these attributes can be measured with specific fitness tests. For the purpose of this project, these definitions of exercise, physical activity and fitness will be applied. Either the term 'exercise' or 'physical activity' will be utilized as appropriate, considering that exercise is a specific and structured subset of physical activity. The primary focus of the recommendations in this paper will be in relation to structured exercise, though it should be noted that some of the referenced guidelines employ the term 'physical activity' to describe exercise guidelines.

Physical activity guidelines. Since the publication of the review by Warburton et al. (2006), the Public Health Agency of Canada (PHAC) has ceased distribution of physical activity guidelines and instead supported the Canadian Society for Exercise Physiology (CSEP) in reviewing the scientific evidence on physical activity and developing new physical activity guidelines. CSEP has developed Canadian Physical Activity Guidelines and Canadian Sedentary Behaviour Guidelines (CSEP, 2013). To achieve health benefits, CSEP (2013) recommends adults aged 20-65 years should accumulate at least 150 minutes of moderate to vigorous intensity aerobic physical activity per week, in bouts of 10 minutes or more; it is also beneficial to add muscle and bone strengthening activities using major muscle

groups, at least 2 days per week. More daily physical activity provides greater health benefits.

Meeting the minimum requirements set by public health guidelines is especially important for improving mood and potentially affecting the course of depression itself (Dunn et al., 2005). Many public health sources recommend daily step goals of 10,000 steps for adults, equivalent to about 8 kilometers, burning 300 to 400 calories, which may be achieved with an active lifestyle that includes a 30-minute walk each day (Choi, 2007). The 10,000 steps guideline fits with the CSEP physical activity guidelines, and performance measures at the patient level can be collected with the use of pedometers. For many Canadians, there is a daily deficit of approximately 4000 steps (Choi, 2007). The 10,000 steps prescription fits well with the fact that physical activity is broader than structured exercise sessions, and should persist to some degree throughout each day.

Exercise guidelines are of value, especially since exercise is not without inherent risk. Exercise may be harmful if performed in an inappropriate or very intense manner, as in conditions such as “excessive exercise” or “overtraining syndrome” (Peluso & Guerra de Andrade, 2005). Guidelines therefore provide support for individuals and health care professionals in assessing physical activity needs. Beyond providing guidelines, however, is the more daunting challenge of adherence to those guidelines. The concept and realities of adherence will be discussed in the following section, to contextualize the issue as a major factor of physical activity uptake.

Assessing readiness for exercise. Adults who wish to engage in physical activity may approach their primary care providers either because they are looking for guidance or because they have been referred by a fitness professional for medical clearance. Considering

the potential risk of physical activity, it is imperative to guide patients through safe progressions in building up to the minimum target outlined by physical activity guidelines. Canadian adults who enroll in community fitness programs are screened by fitness professionals using the Physical Activity Readiness Questionnaire (PAR-Q) (CSEP, 2002), which is used to assess medical risk associated with exercise in the context of potential underlying cardiovascular disease. Fitness leaders may also follow the PAR-Q+, which is more appropriate for sedentary older adults or those with chronic conditions (CSEP, 2012). From participant responses, community members may be flagged and restricted from community exercise programs and referred to primary care providers for further assessment and recommendations for physical activity.

Through health assessment and physical examination, the primary health care practitioner can determine capacity and contraindications to exercise for individual patients. Precise assessment of cardiorespiratory fitness is obtained by ventilatory gas analysis at maximal exertion ($VO_2\text{max}$), but this level of precision is not warranted in general practice. Absence of feasible assessment methods and consensus guidelines for interpreting health-related fitness levels may contribute to a lack of fitness evaluation in most primary care settings (Jurca et al., 2005). The prediction of fitness from non-exercise models seems most appropriate for widespread use in many healthcare settings (Jurca et al., 2005). A full discussion on the methods of non-exercise fitness assessment is beyond the scope of this paper, however, research has found that fitness may be assessed from a non-exercise model, including age, gender, body mass index, resting heart rate, and self-reported physical activity (Jurca et al. 2005). Algorithms have been developed which may be practical and cost-effective for non-exercise fitness assessment in primary care (Jackson et al., 2012;

Stamatakis, Hamer, O'Donovan, Batty & Kivimaki, 2012). Assessments of body weight, blood pressure, cholesterol levels, and smoking habits are relatively easy to obtain, and are routinely obtained and used in patient counseling (Jurca et al., 2005). Fitness assessment is equally important and primary health care providers should have consistent methods for including assessments of readiness to exercise in routine screening. In primary care, it is more appropriate to assess readiness for exercise in patients who wish to begin exercise programs, and provide medical clearance for exercise as tolerated. An example of an algorithm for a non-exercise test of cardiorespiratory fitness can be found in Appendix IV.

Adherence

Adherence to a healthy lifestyle is a persistent challenge for all kinds of people. The challenge of adherence is particularly significant for patients with depression. Depression has been linked to poor adherence to healthy lifestyle behaviours including physical activity repeatedly in the literature (Arikawa, O'Dougherty, Kaufman, Schmitz & Kurzer, 2011; Bigger & Glassman, 2010; Corrigan et al., 2012; Courneya et al., 2008; DiMatteo et al., 2000; Durrani, Irvine & Nolan, 2012; Glazer, Emery, Frid & Banyasz 2002; Martin, Williams, Haskard & DiMatteo, 2005; McGrady, McGinnis, Badenhop, Bentle & Rajput, 2009; Moreau et al., 2009; Ockene, Hayman, Pasternak, Schron & Dunbar-Jacob, 2002; Rogerson, Murphy, Bird & Morris, 2012, Ziegelstein et al., 2000). The link between depression and poor adherence may suggest a negative feedback loop (DiMatteo et al., 2000), and leads to the question – does depression cause nonadherence or does nonadherence cause depression? Bidirectional causal pathways are likely to link poor adherence to health behaviours with depressed mood (Allgöwer, Wardle & Steptoe, 2001). There may be hope for improving adherence to physical activity for patients with depression, though it is a

challenge. The manifestations of depression itself are obstacles to adherence, considering depressive symptoms may include low mood, lack of interest, apathy, physical pain or discomfort, psychomotor delay, low energy, despair, difficulty thinking or concentrating, trouble with making decisions, change in sleep, and potentially suicidal thoughts (García-Toro et al., 2012).

Adherence: The concept. Within health-related literature, adherence is often found to be synonymous with compliance. Synonyms to comply include obey and conform, which implies following a paternalistic path with lack of empowerment or freedom of choice. Synonyms to adhere include remain, hold, stick, and stay, which may be more appropriate for the concept of following a self-directed path. In pharmacology literature, the term adherence has been recognized as more appropriate than compliance to reflect the partnership between the health care provider and the patient (Tilson, 2004). A concept analysis of adherence by Bissonnette (2008) found through review of literature from pharmacy, mental health, medicine and nursing that there was no distinct differentiation between adherence and compliance. From the concept analysis, the accepted definition for adherence was “the extent to which patients follow the instructions they are given for prescribed treatments”. Of note, no definition was found that reflected a patient-centred approach, the dynamic nature of adherence behaviour and the power imbalance applied by terms such as adherence or compliance.

The term concordance is becoming more prevalent in literature, and perhaps is theoretically different than adherence in that it is an attempt to equalize the power balance between healthcare professionals and patients, while at the same time placing patients' expectations about treatment recommendations as equal to or even more important than

healthcare professional's expectations (Bissonnette, 2008). Concordance more accurately describes interactions in which the expertise of patients and health care professionals can be pooled to arrive at mutually agreed upon goals (Bissell, May & Noyce, 2004). The term "adherence" has been selected for this project, since it is currently the most widely used and appropriate term in the literature. Understanding ways in which to improve adherence to physical activity in those with depression will enable the NP, and health care providers, to improve the health outcomes of this high risk population.

Primary Health Care and the Nurse Practitioner

Primary care (PC) and primary health care (PHC) are terms that are often employed interchangeably, but they denote overlapping concepts. Comparing and contrasting these concepts is beyond the scope of this project, though understanding the terms is fundamental to understanding the role of the practitioner, particularly in relation to the provision of health promotion to patients. Primary care has traditionally been considered a patient's chief source for regular medical care, ideally providing continuity and integration of health care services. Primary care is the first point of access for requesting non-emergent medical attention, and this care focuses on assessment, diagnosis and treatment. Primary care is typically accessed via the patient's regular provider or a walk-in clinic, usually by a family physician or NP.

While the primary care system is the prevalent model of care in Canada, there are efforts to encourage a shift in focus from primary care to primary health care (Chauvette, 2003). PHC constitutes a broader perspective of care that includes PC, which derives from core principles articulated by the World Health Organization (WHO) and describes an approach to health policy and service provision that includes both services delivered to individuals and population-level public health-type functions (Muldoon, Hogg & Levitt,

2006). The ultimate goal of PHC is better health for all (WHO, 2008). The WHO has identified five key elements to achieving that goal: reducing exclusion and social disparities in health (universal coverage reforms); organizing health services around people's needs and expectations (service delivery reforms); integrating health into all sectors (public policy reforms); pursuing collaborative models of policy dialogue (leadership reforms); and increasing stakeholder participation.

A progressive and practical Canadian definition of PHC in the functioning clinical setting is as follows: "Primary Health Care is defined as a set of universally accessible first-level services that promote health, prevent disease, and provide diagnostic, curative, rehabilitative, supportive and palliative services" (Chauvette, 2003). This definition includes the traditional role of primary care in which the main functions were diagnostic and curative, as well as the expanded role of *health* care, which includes prevention and wellness in the forms of screening, health promotion, support, rehabilitation, and palliative care. The Canadian Nurses Association (CNA) distinguishes between the current reality of PC and PHC. The CNA states that primary care is the *delivery* of community-based clinical services focused on diagnosis, treatment and management of health conditions as well as health promotion and disease prevention (CNA, 2012b). Primary health care, by contrast, is a principle-based and comprehensive *approach* that aims to strengthen health systems and improve population health; it is promotive, preventive, curative, restorative, rehabilitative and palliative (CNA, 2012b). These descriptions of PC and PHC will be employed as the practical definitions for the purpose of this project. Since depressive disorders are commonly managed through PHC with a mandate for individualized health promotion, PHC was chosen as the clinical practice approach for health promotion within this project.

Primary health care is delivered by health care professionals across Canada in various locations and practice settings. NPs are key participants in the PHC approach in their delivery of services in any setting. NPs practice with a holistic nursing perspective, integrated with the autonomous diagnosis and treatment of acute and chronic illnesses, including prescribing medications (CRNBC, 2012). NPs are health professionals who have achieved advanced nursing practice competencies at the graduate level of nursing education, to provide health care services from a holistic nursing perspective, integrated with the autonomous diagnosis and treatment of acute and chronic illnesses, including prescribing medications, within their legislated scope of practice (CRNBC, 2011b; adapted from CNA, 2010). Across Canada, NP scope of practice varies between provinces, as do educational and examination requirements (CNA, 2009).

The NP can manifest the PHC approach at the clinical level, since NPs work with individuals and communities across the continuum of care based on principles of PHC (CNA, 2009). Health promotion is a key component of PHC in the goal of better health for all, and promotion of physical activity is a significant role of NPs. NPs supporting chronic disease self-management have contributed to consistently reducing smoking and alcohol use, shorter hospital stays, decreased hospital admissions and more appropriate office visits, as well as favourable affecting health and functional status and mortality rates (CNA, 2012a). Given this success, NPs are well prepared to support physical activity in patients with depressive illness. The NP can do this by assessing readiness for exercise, promoting exercise, and collaborating with the individual on an exercise plan. This PHC approach can be used in either a PC or PHC setting, and PC providers can start to add PHC approaches to their practice by promoting activities including exercise and exercise adherence.

The recommendations in this paper are primarily intended for use by NPs in practicing in Canada in non-acute care settings, though these recommendations may be relevant to other providers such as nurses, clinical nurse specialists, physicians, physiotherapists, occupational therapists and other health care professionals, and alternative care providers in Canada or other nations. NPs frequently collaborate with other health care providers in practice. NPs are accustomed to inter-professional delivery of care, wherein they practice autonomously but frequently collaborate with other care providers for coordination of optimal patient care. NPs possess collaborative skills that develop throughout their undergraduate nursing education and practice, and within their graduate education. Collaboration is foundational to NP philosophy, education and practice. A primary care NP is often at the centre of a network of care providers coordinating overall care, and thus well-positioned for health promotion at the individual level.

CHAPTER 2

Methods

To address the research question behind this project, an integrative literature review approach was undertaken. The integrative literature review method allows for literature from varied sources and using varied methodologies to be examined in order to present the current state of science for direct application of evidence to practice and policy (Whittemore, 2005). This literature review was undertaken in four stages: conceptualisation and identification of a search strategy, preliminary search, focused search, analysis and reporting.

Stage I: Conceptualisation and Search Strategy

The conceptualisation phase of this review formed the foundations of the search strategy. The topic was born out of an identified need for increasing physical activity in Canadians, in particular for patients with depressive disorders. The area of focus for meeting this need is the role of the NP. Adults with depression were chosen as the target population, since depression is a widespread problem in Canada and correlates with poor adherence to healthy lifestyles. The following research question was formed: How can the nurse practitioner facilitate adherence to physical activity for adults with mild to moderate depression? This question was considered within a primary health care approach, particularly in the primary care setting within Canada.

During the preliminary stages of the review, a number of eligibility criteria were identified to ensure that the most relevant and up-to-date literature was selected. The eligibility criteria are listed in Table 1. Literature pertaining to adults aged 18 and older was included in this study. All types of depression were included for review in searches, with preference given to articles pertaining to mild to moderate depression.

Table 1 *Eligibility criteria for literature review inclusion in the findings*

| | |
|---------------------------|--|
| Inclusion Criteria | <ol style="list-style-type: none"> 1. English language literature, published between January 1999 and October 2013 2. Adults aged 18+ 3. Articles addressing depression, depressed mood 4. Articles addressing related chronic conditions such as anxiety, obesity, cardiovascular conditions/rehabilitation, hypertension, diabetes 5. Articles addressing health promotion, behaviour change, adherence to physical activity, counselling, cognitive behavioural therapy, motivational interviewing 6. Exercise/physical activity, including promotion and prescription 7. Primary care, primary health care, nurse practitioners, physicians |
| Exclusion Criteria | <ol style="list-style-type: none"> 1. Literature focusing exclusively on <18 or >65 years of age 2. Articles addressing other complex conditions such as palliative care, chronic pain, musculoskeletal conditions, HIV/AIDS, cancer, pulmonary conditions, psychosis, mania, schizophrenia, dementia, developmental disabilities, substance misuse 3. Articles addressing musculoskeletal rehabilitation, rehabilitation from substance use, adherence to pharmaceuticals/diet/smoking cessation |

Since depression is associated with a great number of chronic conditions, many articles focused on specific disease populations with depression identified as a comorbidity. Relevant papers concerned with obesity and cardiac rehabilitation were included because there is a breadth of research for those two topics focusing on adherence to exercise and many articles included the added dynamic of depression with relevant findings. Research focusing on those with severe psychiatric disorders or life-limiting comorbidities and complex conditions were excluded in order to narrow the focus to depression. Since the goal of this project is application to practice in Canada, studies were reviewed considering their applicability to Canadian practice. Studies from other nations were excluded if their findings pertained to systems that were not relevant within the context of the current Canadian setting and health care delivery system.

Stage II: Preliminary Search

The literature review began with a preliminary scoping search of relevant literature using the Google Scholar database. This initial search employed the terms *exercise*, *depression*, and *adherence*, yielding 126,000 results. The first 100 titles were reviewed to scan for relevant articles and to develop a set of comprehensive and relevant search terms to be used in the main literature search. Following this initial scoping search, a comprehensive search of the peer-reviewed literature was undertaken using PubMed, Medline, CINHALL, PsycINFO, PsycARTICLES and Cochrane databases. Based on preliminary scoping activity, important search terms, such as *physical activity*, *compliance*, and *concordance*, were identified. In addition, to assess relevance to the NP in primary health care, MeSH headings for searches also included *primary care*, *primary health care*, *physician*, and *nurse practitioner*. Literature was collected by searching various combinations of the search terms in Table 2.

Table 2 *Search terms for the literature review*

| | |
|---------------------|--|
| Population | depression, adults |
| Problem | poor adherence OR compliance OR concordance |
| Intervention | primary health care, primary care, nurse practitioner, physician, stages of change, counselling, motivational interviewing, prescription |
| Outcome | adherence to exercise OR physical activity |

Following an initial database search, titles and abstracts were screened, articles were assessed as to their relevance, and duplicates removed. The initial database search of Medline employed the terms (exercise OR physical activity) AND (depression) AND (adherence OR compliance), yielding 460 results. All titles were screened and 82 abstracts reviewed. The searches did not filter publication dates as to allow for review of older seminal articles, but the best available evidence from 1999 to 2013 was selected for inclusion to find the most current existing literature to address the purpose of this project. Literature was selected based

on its relevance to the topic, scientific rigor, and applicability to clinical practice. To ensure a comprehensive search, hand-searching of existing reference lists was undertaken, although no new studies were identified for inclusion. Eligible articles for review included meta-analyses, systematic reviews, randomized control trials, experimental designs, cohort studies, survey studies, and qualitative studies. A number of papers were captured during the data search that did not warrant review in the findings, yet provided useful background information. These were used to provide greater clarity to the context of depression, physical activity, adherence, and NP practice in PHC.

Stage III: Focused Search

Following the initial search and sorting of the literature, 62 articles were shortlisted for inclusion. These were retrieved and reviewed in detail to assess the quality of the evidence and relevance to the review topic. The critical appraisal tools in a textbook by LoBiondo-Wood and Haber (2005) was utilized to guide the critical appraisal process. A final cohort of 15 primary studies were selected for inclusion in the review of findings. Additional articles provided support for themes and concepts within the review of findings, including one review article and one meta-analysis.

Stage IV: Analysis and Reporting

The selected literature was reviewed in detail. As part of this process, themes were identified and a synthesis of findings was undertaken. These themes and connections that emerged from the literature review served to guide how the evidence was presented. Following a review of the literature, five main themes were identified during analysis of the findings:

- links between depression, exercise, and mood
- key psychosocial elements for physical activity adherence

- provider perceptions and practices
- targeted physical activity promotion strategies
- physical activity counselling approaches

These themes are relevant to potential strategies, and generally pertain either to psychology or physical activity promotion within the context of PHC. Each of these themes contains a focus relevant to the research question.

The following section identifies the key findings from the literature review and moves from the consolidated knowledge in the background to what has been found to be applicable to practice. A total of 15 research articles were selected for analysis in the findings. These themes were further examined and synthesized to identify a list of recommendations for clinical practice, education and research.

CHAPTER 3

Findings

This integrative literature review seeks to delineate how the NP can facilitate adherence to physical activity for adults with mild to moderate depression through primary health care in Canada. Following a comprehensive search of the research literature, 15 key articles were selected and included in this review. Through an analysis of the literature, five major themes were identified, including links between depression, exercise, and mood; key psychosocial elements for physical activity adherence; provider perceptions and practices; targeted physical activity promotion strategies; and physical activity counselling approaches. These themes organize the presentation of findings and guide the discussion. The findings from those selected articles are presented here within the context of PHC NP practice, and relevance to adults with depression.

Links between Depression, Exercise, and Mood

The background of this paper included a description of the complex pathophysiology behind depression and the benefits of physical activity, as well as the role of the NP in physical activity promotion, including exercise prescription. Part of facilitating adherence to exercise includes collaborating with the patient on a realistic and therapeutic exercise prescription. Four studies were identified how depression correlated with poorer physical fitness and mood and that exercise prescription is an importance consideration for adults with depression. These will now be presented.

The first two studies discuss the correlation between depression and reduced physical fitness. As discussed in the background of this paper, depression is strongly linked to sedentary lifestyles as well as obesity. A barrier to physical activity is lack of physical

fitness, which may be a vicious cycle. Lack of fitness will also limit the patient's capacity for exercise and therefore must be considered when prescribing physical activity. Two articles were found which show evidence that adults with depression generally have a reduced baseline physical fitness. Voderholzer et al. (2011) compared the fitness of depressive patients to healthy adults in a control trial. 51 hospitalized depressive patients, fulfilling ICD-10 criteria for depressive disorder, were selected and compared to 51 healthy controls matched for age, sex and body mass index. Standardized physical fitness assessments were conducted using a bicycle ergometer including a measurement of maximum workload, heart rate, lactate concentration, workload at first lactate elevation, individual anaerobic threshold, and workload at individual anaerobic threshold. They found that there was a marked reduction of physical fitness in depressive patients that could not be explained by differences of body mass index or age. Maximum workload was significantly reduced in depressive patients compared to the controls, as was workload at first lactate elevation and workload at anaerobic threshold ($p < 0.0001$). The subjects' severity of depression was not described, and since the depressed subjects were psychiatric inpatients, it would be of interest to study how these findings might compare with depressed patients who are managed in the community. Reduced physical fitness means limited exercise threshold, and this is a paramount consideration when prescribing exercise, especially to adults who are sedentary. The primary care provider must realize that while achieving minimum physical activity guidelines are a worthy goal, sedentary adults with depression may have to begin exercise at very modest amounts, and slow but gradual gains in exercise capacity should be expected.

The reduced physical fitness found in depressed patients is consistent with the trend that depressed people exercise less, as found in the American National Health and Nutrition

Examination Survey (Song et al., 2011). Of the participants from the survey, 4,058 adult respondents (aged 20 years and older) met the criteria for inclusion in this study. Measures included the reliable and valid PHQ-9 (Patient Health Questionnaire) assessment tool for depression, accelerometers (which are reliable and valid to objectively measure amounts of physical activity) worn more than 10 hours at least one day per week, demographic information and self-reported health status to represent population estimates. Bivariate analysis and multivariate logistic regression were applied to the data. The mild depression group showed significantly less light physical activity compared to the minimal depression group ($p < 0.01$), and the moderate to severe depression groups were found to be engaged in less physical activity ($p < 0.001$). In other words, people with mild and moderate to severe depression engaged in physical activity significantly less than those with minimal depression. A strength of this study was its large sample size and population diversity, and a limitation was that it was a survey, and so depressed, inactive individuals would not be as likely to participate overall.

Two other studies were identified which demonstrate that exercise has a direct effect on mood. A randomized control trial by Dunn et al. (2005) studied the dose-response relation of exercise and reduction in depressive symptoms. Participants included 20 men and 60 women aged 20 to 45 with mild to moderate depression, who were randomized to one of four aerobic exercise treatment groups for 12 weeks that varied total energy expenditure and frequency, or to a placebo control group with flexibility exercise only. Treatment groups included low dose aerobic exercise 3 days per week, public health dose aerobic exercise 3 days per week, low dose aerobic exercise 5 days per week, and public health dose aerobic exercise 5 days per week. Participants were screened for depressive symptoms using the

Hamilton Rating Scale for Depression (which was selected because it measures severity of symptoms and is widely used in efficacy studies of antidepressant treatments) at baseline and at 12 weeks. All groups resulted in significant decreases in depressive symptoms after 12 weeks with no independent effect of frequency on reduction of symptoms. Energy expenditure did, however, have an individual effect on reducing symptoms, with the greatest reduction in the public health dose. In other words, exercise was effective in the treatment of mild to moderate MDD, but the amount of exercise needed is equivalent to consensus public health recommendations, and a lower amount of exercise is merely similar to a placebo effect. A limitation of this study is that it was only 12 weeks long and therefore relevant to relatively short-term outcomes of exercise. Women greatly outnumbered men in this study, which is not grossly inconsistent with the incidence of depression in the general population.

Likewise, Weinstein et al. (2010) found that exercise does improve mood in the short-term. This study differs because it examined the effect on mood relative to the intensity of an individual exercise session. The study compared 14 subjects diagnosed with major or minor depressive disorder (using DSM-IV criteria) to a control group of 16 participants. The exercise sessions were acute bouts of 30 minutes on a graded treadmill, progressing from warm-up to moderate and then vigorous workload and ending with a cool-down. Mood assessments were made prior to exercise, immediately post-exercise, and 30 minutes after completion of exercise. Depressive symptoms were measured using structured clinical interviews (SCID, a standard diagnostic tool) and the Beck Depression Inventory (BDI). The BDI is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression and is a reliable assessment for the severity of depression (Beck et al., 1961). Immediately following exercise, the depressed individuals displayed

improvements in mood, but subsequently exhibited increased depressed mood and fatigue at 30 minutes after exercise. These delayed increases in depressed mood and fatigue were higher in depressed participants compared to controls. The authors concluded that the findings from this control trial may partially explain reduced initiation and adherence to exercise programs in depression, and this finding may be particularly relevant to exercise attrition. The findings from this study are consistent with an earlier review article by Peluso and Guerra de Andrade (2005), which found that moderate exercise improves mood on a medium and long-term basis (or helps maintain it at high levels), while intense exercise leads to worsened mood lasting days to weeks, especially in the construct of depression. These findings are significant for exercise prescription, supporting the recommendation of mild to moderate intensity exercise rather than high intensity.

Since diminished mood is the main dilemma for those coping with depression, understanding the link between depression, exercise and mood is imperative to developing systems of care that support patients to engage in, and facilitate adherence to, physical activity. In particular, this may include encouraging the uptake of strategies, such as exercise prescription, to optimize adherence and patient outcomes. Additional research in more varied health care settings, including the primary care setting, is needed to understand this further and ensure that patients receive adequate support for physical activity.

Key Psychosocial Elements for Physical Activity Adherence

Adherence to physical activity is influenced by a variety of barriers and challenges. There are many reasons why patients fail to adhere to physical activity, with the vast majority directly pertaining to mental states (Arikawa et al., 2011; Bigger & Glassman, 2010; Glazer et al., 2002; McGrady et al., 2009; Ockene et al., 2002; Rogerson et al., 2012, Ziegelstein et

al., 2000). Three studies were selected that analyzed psychosocial factors in adhering to exercise for adults with depression. The first was a qualitative study of people with coronary heart disease and depressive symptoms identified barriers to and facilitators of physical activity (Rogerson et al., 2012). The study included 15 participants ranging in age from 47 to 75 years with coronary heart disease and depressive symptoms. In-depth, semi-structured interviews were conducted, investigating experiences of physical activity since their cardiac event. Open-ended questions focused on investigating participants' experiences with physical activity since their cardiac event. Elaboration and clarification probes were used to explore issues in more depth. After transcription, the interviews were analysed and adapted to exercise and sport. An inductive approach to content analysis was used to allow the themes to emerge from the quotes. Quotes were clustered with other quotes with similar meaning, forming raw data themes, which merged to form higher-level themes. Depressive symptoms were measured using the Cardiac Depression Scale, which was shown to be a reliable and valid tool in research (Rogerson et al., 2012). The study found barriers that included low mood, negative perceptions of health and lifestyle changes, lack of motivation to exercise, perceived external obstacles, physical restrictions, fear of exercise, and lack of knowledge regarding exercise. Facilitators included experiencing the psychological benefits of exercise, the positive role of others, having a reason for exercising, and using psychosocial strategies. The significance of these findings is that a key barrier is intrinsic state of mind, while a key facilitator is external social supports. This qualitative study adds an important patient perspective that can be useful for PHC providers when examining the promotion of physical activity and the potential barriers. Limitations of this study may include a lack of wider

generalizability to practice, however, in keeping with the qualitative approach, the study would have transferability to other similar settings.

Likewise, social supports were found to be a significant factor to adherence to healthy behaviours in a study by Allgöwer et al. (2001). They investigated the relationship of depressive symptoms, social support, and a range of personal health behaviours through a survey questionnaire, collecting data from 2,091 male and 3,438 female university students from 16 countries. This was a well-constructed study with a large sample size. Depressive symptoms were measured using the short BDI and social support was measured using six-item version of the Social Support Questionnaire (SSQ), which has been tested as a reliable measure (Sarason, Sarason, Shearin & Pierce, 1987). Data was analyzed using multiple logistic regression with Stata, using 95% confidence intervals, and men and women were analyzed separately to distinguish between the potential impact of gender. Depressive symptoms were found to be significantly associated with lack of physical activity, not eating breakfast, irregular sleep hours, and not using a seat belt in both men and women, and additionally with smoking, not eating fruit, and not using sunscreen among women. Low social support was independently associated with lack of physical activity in men and women. These are important factors that an NP could consider when assessing and providing counselling for the patient with depression in relation to exercise, and social support is consistently a significant factor for consideration.

Social support during exercise was again a plausible factor in the findings from a non-blinded control study from Denmark (Oeland, Laessoe, Olesen & Munk-Jorgensen, 2010) which aimed to investigate if patients with depressive disorders can achieve a level of physical activity meeting public health recommendations through participation in a physical

exercise program. Participants met the criteria of being diagnosed with depression based on ICD-10 criteria. The intervention group consisted of 27 participants over age 18, who were compared to 21 controls. The intervention was 20 weeks of group exercise consisting of aerobic training and weight-lifting against a control group with no exercise intervention. Participants were interviewed and tested at baseline, week 20, and week 32. Severity of depression was measured by the Hamilton Rating Scale. Physical measurement included weight, blood pressure, muscle strength and aerobic capacity (assessed by a submaximal bicycle ergometer test with moderate intensity to calculate VO_2 max indirectly). It was found that physical activity and improvement were dependent on the presence of the instructor, and in the follow up period, improvement stopped. A factor to consider within this study was the potential effect of the *group* exercise. Being part of a group may have also imposed social support, and this social component may have contributed to adherence. There was a high attrition rate in the study, notable for the problem of adherence. Patients with depressive disorders who participated in a structured, supervised exercise program succeeded in reaching a higher level of physical activity, implying that adults with mild to moderate cases of depression may benefit from being offered structured exercise programming. The challenge of this is how to integrate this finding into the 'real-world' management of depression.

The significance of the social factor on adherence to health behaviours was echoed in a meta-analysis by DiMatteo (2004), which examined 122 empirical journal articles to study how social support, emotional support, and family status influenced adherence to medical treatment. The study found that adherence 2.35 times higher with greater levels of support while the risk of non-adherence is 1.53 times higher among patients with low social

support. The study also found emotional support, family cohesiveness, and family conflict to be significant factors in adherence to treatments. Marital status and living with another person was found to increase adherence modestly for adults. Similarly, Searle et al. (2013) echoed the importance of significant others and social participation for participant experiences in the TREAD trial. The evidence indicates that the NP should encourage patients to identify potential social contacts for supporting adherence to physical activity on a regular basis.

Provider Perceptions and Practices

Provider perceptions and practices related to the promotion of physical activity emerged as a key theme in the contemporary literature. Both NPs and physicians can promote physical activity in the context of PHC, and this task can be rewarding but also challenging and even frustrating. NPs can focus on physical activity promotion from a PHC approach to all of their patients, including adults with depression. The role of physical activity promotion may be particularly important for adults with depression since adherence rates are low in this population. Three survey studies were collected that assessed health care provider perceptions and experiences with physical activity promotion in practice.

A study by Walsh, Swangard, Davis and McPhee (1999) collected surveys from 175 physicians from family practice and internal medicine regarding their practice with exercise counselling. The survey had been used in a prior study and was also based on ACSM exercise guidelines as a standard. The study found that physician confidence was a factor in exercise counselling. Physicians who felt they had adequate exercise knowledge were more likely to ask about (72% versus 49%) and counsel about (48% versus 29%) exercise than those who felt their knowledge was inadequate, and physicians who felt that they were

successful in changing behaviour were more likely to ask about and counsel about exercise. Personal fitness and exercise habits were suggested in this study as potential factors influencing exercise counselling practices though it was not a significant finding. The greatest barriers to exercise counselling in rank order included not having enough time, needing practice in effective counselling techniques, belief that counselling patients will not lead to behaviour change, being unsure about exercise knowledge, thinking that patients are not interested, and feeling that time is better utilized counselling about other lifestyle changes. This study is now dated and physician focused, however it provides a relevant acknowledgement of some potentially significant barriers for the NP in primary health care with regards to performing effective exercise counselling today as well. Lack of education has been echoed in more recent literature, notable in an American study which found that NPs are knowledgeable, confident and currently providing some physical activity counselling to patients, however they are interested in receiving additional training to aid in providing physical activity counselling (Grimstvedt et al., 2012).

Since the NP seeks to embody the PHC approach, the promotion of physical activity should be a routine fundamental component of practice. An American study by Tomkins, Belza and Brown (2009) sought to describe NP practice patterns for exercise counselling for adults. Using a cross-sectional design, participants completed a self-administered questionnaire to discover barriers and facilitators within exercise counselling. The Exercise Evaluation Inventory was developed by the investigators with both fixed and open-ended questions, born out of literature review and validated through a pilot test with NPs prior to administration within the study. NPs were recruited to participate at an annual national conference and, inclusion criteria included NPs who practice with adult populations in

primary and/or specialty clinical areas. Descriptive statistics and SPSS software were to analyze data. In a survey of 398 NPs, it was found that the majority of NPs valued the intervention of exercise counselling as much as prescribed medication, but only half of the providers were counselling about exercise to more than half of their patients. It was noted that counselling included emphasizing the recruitment of other individuals for support, and safety precautions for older adults. It was also suggested that adherence to exercise could perhaps be enhanced by problem-solving with patients to address concerns such as harsh weather conditions. This study is specifically relevant to NP practice and included a large sample size.

With a similar purpose, LaMarche & Vallance (2013) conducted a recent survey to learn about the attitudes and practice of Canadian NPs counselling patients about exercise. In this cross-sectional study, NPs were recruited to participate through national electronic mailing lists. They used a self-administered Internet-based questionnaire with 148 respondents to explore how NPs perceive their competence in prescribing physical activity and the importance they ascribe to doing so. Respondent level of physical activity was assessed using a modified Leisure Score Index (LSI) from the well-validated Godin Leisure-Time Exercise Questionnaire (GLTEQ). The degree of physical activity counselling was assessed an open-ended question, and the importance they ascribed to this practice was assessed using the previously validated Exercise and Physical Activity Competence Questionnaire (EPACQ). Statistical analyses were performed using SPSS version 20 and multivariate analysis of variance (MANOVA) was conducted. Responses to open-ended questions were categorized by theme. Overall, the findings were that respondents felt fairly competent in their ability to prescribe physical activity and that this function was important,

and both of these instances were positively correlated with frequency of prescribing. On average, respondents prescribed physical activity to 59 per cent of their patients, and the most commonly reported barrier was a lack of time. Patient factors that most commonly prompted physical activity prescription were overweight or obesity, type 2 diabetes, hypertension and cardiovascular health. A lack of specific education in preventive medicine in NP education was identified. This study is particularly useful since it was a relatively large sample size and provides current data. From the literature reviewed, it is clear that promoting adherence to physical activity requires significant time and resources on the part of the NP or other primary care provider, as well as a commitment to helping patients identify solutions to overcome their own barriers to physical activity. Understanding both of these factors may enhance the delivery and adherence to health promotion and education activities aimed at promoting physical activity in patients with mild to moderate depression.

Targeted Physical Activity Promotion Strategies

The management of depression frequently entails more than one health professional. A review of the literature identified that interdisciplinary approaches to physical activity promotion may improve patient adherence and outcomes. Two randomized control trials were collected that sought to improve physical activity adherence among patients through targeted physical activity counselling. One British study focused on adults with depression, while one Canadian study pertained to broad adult populations without isolating depressed subjects. These will now be discussed.

The TREAD trial was designed to improve long-term adherence to physical activity (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012). It assessed TREATment of Depression with physical activity, investigating the intervention of facilitated physical

activity as an adjunctive treatment for adults with depression presenting in primary care (Baxter et al., 2010). The intervention was based on theory and aimed to provide individually tailored support and encouragement to engage in physical activity. This robust randomized control trial was conducted in Britain with 361 adults aged 18 to 69, which is the age range of interest for this project. All those randomised had a diagnosis of an episode of depression as assessed by the clinical interview and a BDI score of 14 or more. This score signifies at least mild mood disturbance. In addition to usual care, intervention participants (n = 182) were offered up to 3 individualized face-to-face sessions and 10 telephone calls with a trained physical activity facilitator over 8 months. The facilitators held a degree in either psychology or exercise science and were trained in motivational interviewing (MI), self-determination theory (SDT), and the transtheoretical stages of change model (SCM) (Haase et al., 2010). Sessions and phone calls included discussions of barriers and strategies, tailored goal-setting strategies, and confidence assessment. Depression symptoms were assessed using the BDI at 4 months post-randomisation. Secondary outcomes of the study included use of antidepressants and physical activity at the 4, 8, and 12-month follow-up points, and symptoms of depression at 8 and 12-month follow-up. Analysis used linear and logistic regression models in Stata 11.1 software to examine the relationship between the study variables.

Results from the TREAD trial showed that there was no evidence that the facilitated physical activity intervention improved depression or reduced the use of antidepressants compared with usual care. The study did find, however, that participants allocated to the intervention group reported more physical activity during the follow-up period than those allocated to the usual care group (95% confidence interval; $p=0.003$) (Chalder, Wiles,

Campbell, Hollinghurst, Haase, et al., 2012), showing that the intervention was significant for improving adherence to exercise. These findings support referral to physical activity intervention programs for the purpose of increasing physical activity adherence for adults with depression, but this is usually not feasible or available in current Canadian primary care settings. An intervention to this extreme is simply not cost-effective in routine care (Chalder, Wiles, Campbell, Hollinghurst & Searle, 2012). An important finding, however, is the potential for improving adherence based on the intervention by the facilitator. It may be worthwhile for the NP to consider collaboration with accessible professionals for joint efforts towards physical activity counselling, either in the psychology counselling field or the physical fitness field. The nature of the added social interaction inherent within this study between the facilitator and the depressed client is notable for in and of itself potentially influencing exercise adherence. A significant limitation from of this trial is the feasibility within Canada's public health care system to implement such a labour-intensive program, given the expense of the hours of the facilitators.

A coordinated interdisciplinary approach to exercise adherence has been demonstrated in the wider literature. For example, another randomized control trial was conducted in Canada. This well-designed trial had a similar purpose of improving adherence to physical activity but studied underactive adults rather than those with depression. Theoretical concepts included SDT, social cognitive theory (SCT) and MI. The Physical Activity Counselling (PAC) trial included a smaller number of participants, 120 adults (mean age 47.3 ± 11.1 years, 69.2% female) who reported less than 150 min of physical activity per week (Fortier et al., 2011). Subjects were recruited from a large community-based Canadian primary care practice. Subjects were predominantly middle-aged, female, urban, well-

educated, employed, overweight or obese, and of white French-Canadian ethnicity. Of note, 25 of the 120 participants had a diagnosis of depression and/or anxiety. After receiving brief physical activity counselling from their primary care provider, subjects were randomized to receive 6 additional patient-centered counselling sessions over 3 months from a physical activity counsellor (intensive-counselling group; $n = 61$), or no further intervention (brief-counselling group; $n = 59$). Counsellors were CSEP Certified Fitness Consultants (the authors noted that the CSEP Certified Exercise Physiologist certification did not yet exist at the time of the trial). Physical activity was measured through self-reporting using the Total Leisure Activity Score of the GLTEQ at baseline, 6 weeks, 13 weeks (end of intervention), 19 weeks and 25 weeks (Fortier et al., 2007). The GLTEQ was selected for its superior reliability and validity when compared to other measures of self-reported physical activity. Accelerometers were worn by all participants during waking hours for 2 weeks at baseline, at week 13 and week 25, as accelerometers have proven to be both reliable and valid for assessment of physical activity. SPSS was utilized to examine variance and covariance in the self-reported physical activity.

The intensive-counselling group self-reported significantly higher levels of physical activity at 6 weeks ($p = 0.009$) and 13 weeks ($p = 0.01$), but this was not sustained by 25 weeks (12 weeks after the intervention concluded). There were no differences in self-reported physical activity between the groups after the intervention in the follow-up period, nor was there any increase in accelerometer-measured physical activity. Results for physical activity depended on the method used, with positive short-term results with self-report and no effects with the accelerometers. Quality of life was also assessed, and physical and metabolic outcomes were evaluated in a randomly selected subset of patients (33%). There was no

significant effect on quality of life in either group. The intensive-counselling patients did show greater decreases in percent body fat and total fat mass from 13 weeks to 25 weeks ($p < 0.05$), which is perhaps the most significant result supporting the value the intervention. The results of this study show that while brief counselling by the primary care provider may contribute to modest improvement in physical activity in the short-term, greater improvements are seen with collaborative care along with a certified fitness professional. Long-term adherence was not sustained in this study, suggesting that ongoing counselling may be required. Since this study included participants diagnosed with depression, the results hold some relevance for contributing to understanding how to possibly affect adherence patterns in primary care. A limitation of this study is that the population was not overly diverse, and not specifically reflective of adults with depression. The NP must consider ongoing support to promote optimal adherence to exercise over the long term for patients with depression.

The literature highlights the importance of engaging other health care professionals to optimize the long-term adherence to physical exercise, particularly for patient with depression. While a full collaborative approach to the promotion of physical activity is not be feasible for every patient in the primary care setting, the NP can draw on examples of techniques discussed in the literature to improve adherence (such as MI) or target specific interdisciplinary supports (such as counsellors) to facilitate adherence to physical activity in high risk population groups, such as those with depression.

Physical Activity Counselling Approaches

Counselling is a major component of depression management in practice. Following a comprehensive review of the contemporary literature, counselling was identified as an

important component of supporting physical activity in patients with depressive illness. NPs, as PHC providers, can provide counselling to improve adherence to physical activity. Three studies were identified that examined counselling approaches that were based on widely used theories in counselling health promotion. Through the literature search, it was found that patient perception is paramount to understanding adherence factors for adults with depression. Understanding this patient perspective is an important component of counselling. The studies that were identified explore the importance of patient perceptions and counselling. They were qualitative in nature and sought to understand how the patient with depression perceives and responds to physical activity promotion strategies. Two of the trials discussed in the previous section were accompanied by qualitative studies assessing feelings of the participants. These qualitative findings will be discussed in the context of the theories and counselling techniques that were integral to the study methods. These counselling methods may be commonly applied in PHC practice.

A qualitative study was conducted as part of the TREAD study discussed in the previous section (Searle et al., 2013). The TREAD study was a randomised control trial of facilitated physical activity for adults with depression based on self-determination theory, the stages of change model, and motivational interviewing (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012). The trial intervention was delivered by physical activity facilitators who aimed to enhance participants' sense of competence, autonomy and relatedness within the context of physical activity, through collaboration within a supportive environment aimed at fostering self-motivated and self-regulated behaviour change (Searle et al., 2013). Face-to-face interviews were held with 19 participants at 4 months into the trial focusing on motivation to engage in physical activity and sustain it over time. Twelve

participants were re-interviewed via telephone 8 months later in order to follow up with how the trial had impacted their physical activity and general well-being. Data collection ended when data saturation had been reached. The interviews were coded and analysed in accordance with a Grounded Theory framework using ATLAS.ti software. The trial was valid in that data was analyzed using a framework approach and verified for consistency and comprehensiveness, assessing for discrepancies, contradictory or disconfirming evidence in relation to the emerging themes. The themes that emerged from the data analysis included: relationship with the physical activity facilitators, mode of facilitation (face-to-face versus telephone), impact of contact with facilitator /assimilation and future plans, change in activity since contact with facilitator, and perceived effectiveness of facilitator techniques. It was found that participants felt comfortable with their facilitator, benefited from the contact, felt supported in a way that was pertinent to the participants' situation. The perceived non-prescriptive approach of the facilitators enhanced participant appraisal of the working relationship and bred a sense of responsibility for engagement in activity. Facilitators were described as helpful in guiding participants with their choice of activity. Some participants described how they could utilise the input from the facilitator as coping strategies or as a means of preventing future depressive episodes. The telephone contact in the trial was perceived as regular motivational prompt for self-reflection, a channel for sharing experiences and a form of monitoring and affirming any progress made towards engaging in physical activity. A perception of relatedness to others was expressed in patients having the confidence to accept invitations to engage in activity with others, and some participants felt that significant others were an important source of motivation for engaging in physical activity.

Ultimately, it was found that engagement in physical activity was enhanced within an autonomy-supportive environment. Reflecting on the outcomes of this qualitative arm of the TREAD trial, the intervention was significant for improving adherence to exercise, though not significant for improving depression. This qualitative study may explain factors that contributed to the improved exercise adherence for these adults with depression, despite persisting depressive symptoms. The study was undertaken rigorously, however, alike to all qualitative studies that use smaller sample sizes, the overall generalizability is limited but the findings would be transferable to similar populations and contexts. A physical activity facilitator may fall under the realm of the primary care provider, or any number of other health professionals. Counselling takes considerable time and effort within primary care as well as other disciplines, but there is potential for brief interventions over time to have some effect on sustained health behaviour change. For the NP managing patients with depression, incorporating some of the theory from the facilitator intervention in this trial would be helpful in improving adherence to physical activity for adults with depression. Elements of particular relevance to current primary care practice include the use of MI, individualized discussion, SDT and encouragement of client autonomy, positive encouragement, and of course regular follow-up.

Another qualitative study was conducted within the PAC trial (Fortier et al., 2011). The ultimate goals of the trial were to increase patients' task motivation and task self-efficacy for physical activity and to help them become autonomously motivated to engage in physical activity because one finds it important, it aligns with their life goals, is free from external inducement and is enjoyable (O'Sullivan et al., 2010). Like the TREAD trial, this study emphasized MI and SDT along with SCT in the intention of fostering autonomy,

relatedness and competence. MI techniques included aligning goals and action plans with patient values, resolving discrepancies between physical activity behaviors and patient values/goals, and skill development to enhance feelings of competence toward self-regulation. To better understand why the intervention worked, and the patient perspective of the counselling, a qualitative study was conducted to explore the experiences, thoughts, and feelings of the patients who received both the brief and intensive arms of the counselling intervention (O'Sullivan et al., 2010). The study presented the experiences of 15 patients who described their experience in the intervention through a series of 3 interviews. Interviews were conducted at weeks 6, 13 and 25 and saturation was reached. Interviews were transcribed and coded using NVivo7 software for independent researcher coding to enhance rigor and ensure analysis was grounded in the data. Researchers were aware of the SDT theoretical framework so that the analytical approach was a variant of grounded theory. Discussions were held between researchers to ensure consistency and credibility and peer checking continued until consensus was reached and inter-coder reliability was .80. The study found that patients were satisfied with the intervention and valued the information and strategies, they appreciated the tailored approach, and motivation was enhanced by autonomy support. Feelings of competence were influenced by encouragement and activity levels as well as relatedness towards the counsellor. Participants felt that longer-term support is needed and that everyone should have a physical activity counsellor.

The findings of this qualitative study are consistent with the trial in showing that adherence was only improved during the intervention and not sustained long-term, after the counselling intervention concluded. Counselling techniques such as MI may need to work their way into routine primary care practice in order to have effect on long-term health

behaviour change. The primary care practitioner is often privy to a long-term relationship with patients and may be well positioned to conduct these repeated counselling interventions, even if only brief.

Another Canadian trial assessed the effects of adding stages of change-based counselling to an exercise prescription for older, sedentary adults in family practice (Petrella, Lattanzio, Shapiro & Overend, 2010). The Step Test Exercise Prescription Stages of change counselling (STEPS) was implemented in a 12-month cluster randomized trial in forty family practices in four regions of Canada in both rural and urban settings. Participants in this well-constructed trial were 193 healthy men and women ranging in age from 55 to 85 years in the intervention group and 167 in the control group. Intervention physicians were trained to deliver a tailored exercise prescription and a transtheoretical behaviour change counselling program, while control physicians were trained to deliver the exercise prescription alone. The SCM has been well received and has been explored in various studies, and the practicality of this model is the focus on the individual's readiness for change (Plonczynski, 2000). This model is relevant within the practice of primary care because assessing a patient's readiness for change is essential to guiding personalized health promotion and MI. Narrative reviews are consistent in providing support for the SCM in the physical activity domain (Marshall & Biddle, 2001).

Main outcome measures from this study included predicted cardiorespiratory fitness measured by predicted maximal oxygen consumption ($pVO_2\max$), and energy expenditure measured by a widely used and validated 7-day physical activity recall tool. Mean increase in $pVO_2\max$ was significant (95% confidence interval) for both the intervention and control groups at 12 months ($p < .001$); however, there was no difference between groups. Women in

the intervention group improved their fitness significantly more than women in the control group, while men in both groups showed similar improvement. The intervention group had a 4-mm Hg reduction in systolic blood pressure, while the control group's mean reduction was 0.4 mm Hg ($p < .001$). The mean energy expended significantly increased and was higher in the intervention group than in the control group (69.06 [169.87] kcal/d versus -6.96 [157.06] kcal/d, $p < .006$). Practice setting characteristics did not significantly affect the primary outcomes. This study was effective in demonstrating a wide dissemination of education to primary care providers for the purpose of improving physical activity adherence. A limitation to this study is that major psychiatric disease was an exclusion criterion in participant recruitment, and so the results are not specifically relevant to adults with depression.

From the PAC trial and the TREAD trial, it is evident that counselling, and in particular, MI techniques and SDT approaches can have positive effect on adult adherence to physical activity if maintained over time. The TREAD trial in particular supports this approach for patients with depression, while the PAC trial may hold relevance to depression since it included a number of depressed adults. The transtheoretical behaviour change counselling program from the STEPS trial also had success in increasing adherence for healthy adults (Petrella et al., 2010), and most significantly demonstrated improvement in adherence patterns within routine primary care practice.

While the studies included in the section are more focused on the use of specialist providers such as exercise physiologists and psychologists, they do provide support for the introduction of structured approaches to exercise promotion using models such as the SCM and SDT. The use of exercise specialists may not be possible in most primary care practices, particularly in rural areas of Canada where access to wider health care services is limited.

However, these principles could be easily integrated and used by the family NP to improve the uptake of physical activity in those with mild to moderate depression. NPs provide counselling and support for patients with chronic diseases, and incorporating an assessment of readiness for behaviour change would enhance outcomes. Responsibility for physical activity promotion and follow-up therefore often falls back on the PHC provider, in cooperation with the patient.

In summary, following an integrative review of the literature, 15 articles were selected for review and critically appraised. From the analysis, five themes emerged that have identified the benefits and processes associated with promoting physical activity in patients with mild to moderate depression. The research presented was from a wide range of context, with some integrating assistance from specialists such as exercise physiologists. While some of these interventions are not feasible for all patients within the primary care settings, they provide important evidence for the benefits of physical exercise and the types of activities that may be useful in the population of adults with depression. Promoting physical activity in this population would provide significant health benefits to the patient. The following section will provide a discussion of these findings, as well as recommendations for practice, research and education.

CHAPTER 4

Discussion

The goal of this project was to examine how NPs in Canada facilitate adherence to physical activity for adults with mild to moderate depression, within the context of PHC. An integrative review of the available evidence was undertaken following a comprehensive search of the contemporary literature. A total of 15 studies met the criteria for inclusion for the focus of this project, and were critically appraised. From this analysis, five major themes were identified, including links between depression, exercise, and mood; psychosocial elements for physical activity adherence; provider perceptions and practices; targeted physical activity promotion strategies; and physical activity counselling approaches. These themes were presented in the findings chapter and will now be synthesized further through the discussion of the wider body of literature and the application and relevance to clinical practice. This section will conclude with a discussion of the key recommendations for practice, research and education.

Promoting Physical Activity for those with Mild to Moderate Depression: An Important Clinical Issue

The purpose of this project was to identify how the nurse practitioner can facilitate adherence to physical activity for adults with mild to moderate depression. This integrative review of the literature identified that adherence to physical activity is a widespread clinical issue and particularly problematic for patients with depression (Rogerson et al., 2012). Physical activity is essential for overall health for all Canadians, and so physical activity promotion is an essential component of primary health care. As discussed in the background, physical activity has been shown to have substantial health benefits for the prevention and

management of chronic disease (Warburton et al., 2006). Depression has been linked with a range of clinical conditions, including obesity (Maes et al., 2011), as well a more sedentary lifestyle, since the manifestations of depression present obstacles to adherence (García-Toro et al., 2012). Health promotion interventions have been shown to be effective at increasing levels of physical activity, and such interventions include written materials for patients, behaviour change strategies, and training and materials for PHC providers (Petrella & Lattanzio, 2002). As identified in the review, collaboration with interdisciplinary health care providers and supporting the patient through counselling and exercise prescription is important in facilitating adherence (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011).

The lack of physical activity and its impact on chronic disease is an ongoing issue facing health care providers in Canada (Warburton et al., 2006). The NP needs to have a good awareness of high risk clients, including those with existing depression and other vulnerable groups, in order to target interventions for those 'at risk' groups in order to optimize outcomes. Understanding that patients with depression are particularly at risk for sedentary lifestyles and have a disproportionately large number of other behavioural and psychosocial risk factors (such as smoking, poverty, low education and poor diet), makes them a vulnerable population for poor health overall (PHAC, 2006; Song et al., 2011; Voderholzer et al., 2011). The wider literature related to the promotion of physical activity supports the need to identify those most at risk. For example, an American study identified that underserved or vulnerable populations are particularly at risk for lacking clinician-initiated physical activity promotion, including minority ethnic backgrounds such as African Americans, Hispanics, and Asian Americans, or vulnerable populations such as persons with

low educational attainment, low income, lack of insurance, or those residing in rural communities (Carroll et al., 2008). This highlights the need for improved and targeted health promotion to facilitate adherence to physical activity for those with depression. The interventions in this review were experimental and did not succeed in long-term success with exercise adherence for adults with depression because the interventions were not sustainable (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011; Petrella et al., 2010). There were short-term successes in adherence, and so it is important to understand the elements of care that led to this success.

Facilitating Adherence to Physical Activity: Practical Approaches

From the integrative review, several strategies were identified in literature as possibly effective for facilitating adherence to physical activity for those suffering from depression. These strategies included counselling techniques, assessing readiness for exercise, and individualizing exercise prescription (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011; Petrella et al., 2010). Adherence over the long term was noted as a significant challenge, which may be addressed through social support as well as frequent follow up by a healthcare provider that has a longitudinal relationship with a given patient.

Counselling techniques. The need to incorporate counselling techniques as part of health promotion activities to facilitate adherence to physical activity was identified in three of the trials featured in this review: the TREAD trial (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012), the PAC trial (Fortier et al., 2011), and the STEPS trial (Petrella et al., 2010). These recognized that a formal counselling approach based on psychological theory has the potential to improve long term adherence to physical activity. Self-determination theory was employed in the TREAD trial (Chalder, Wiles, Campbell,

Hollinghurst, Haase, et al., 2012) and the PAC trial (Fortier et al., 2011) along with motivational interviewing. Social cognitive theory was also referenced in the PAC trial (Fortier et al., 2007). An overview of these approaches can be found in Appendix I. For example, self-determination theory (SDT) represents the latest evolution of the paradigm formerly encompassed by the concept of treatment adherence (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011). SDT rests on a human ethic and reflects a psychological reality that people should have the freedom to choose, and they make choices all the time (Corrigan et al., 2012). Providers must therefore work with patients to ensure that they are appropriately educated and fully informed of the risks and benefits of physical activities. Likewise, the authors of the PAC trial (Fortier et al., 2007) identify that since the actualization of adherence is behaviour, and the most significant predecessor to behaviour is motivation, the health care provider must ascertain the patients motivation and self-efficacy to engage in physical activity as part of the clinical interaction. Understanding the relationship between exercise and motivation has been discussed in the wider literature, and Plonczynski (2000) discussed the relationship between these concepts. A summary of this can be found in Appendix II.

Finally, motivational interviewing and the assessment of stages of change model were seen as an important techniques in Chalder, Wiles, Campbell, Hollinghurst, Haase et al. (2012), Fortier et al. (2011) and Petrella et al. (2010), and as part of this, the health care provider can assess factors relevant to adherence. Motivational interviewing (MI) is a complex and skilful psychotherapy method that can be used to support the individual to identify healthy behaviours and health needs. MI was identified in (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011) as a potential counselling

technique for use in this high risk client group. A review of the process of MI is beyond the scope of this paper but a meta-analysis of motivational interviewing found that patients receiving MI were more likely to have improved outcomes in relation to physical activity promotion, including greater adherence, engagement and retention over time (Hettema et al., 2005). Similarly, the stages of change model (SCM) was identified by Chalder, Wiles, Campbell, Hollinghurst, Haase et al. (2012) and Petrella et al. (2010) and may be particularly useful in the care of patients with mental illness, as it informs how to recognize and acknowledge readiness for change and adherence. The theory has been utilized broadly in the chronic disease literature (Plonczynski, 2000) and is useful in health promotion for predicting important treatment outcome measures, and stage of change assessment may be relatively brief but has vital implications for guiding treatment method and promoting therapy progress (Norcross, Krebs & Prochaska, 2011). Further information on the SCM and the potential role of the health care provider can be found in Appendix III. It became evident from this review that a multifaceted approach is needed to facilitate adherence to physical activity for those with depression. These complex counselling models further demonstrate the complexities of managing adherence to physical activity for adults with depression.

Health promotion can be overwhelming for the health care provider because broad guidelines must be enacted at individual levels to produce effect, and the patient is ultimately responsible for behaviour choices. Ongoing individualized health promotion is essential to assisting with adherence to healthy lifestyle behaviours, including physical activity, and this falls under the realm of PHC. Brief interventions in primary care over the long term can be of great value to exercise adherence (Fortier et al., 2011). Counselling techniques such as MI would hold value as part of routine primary care practice for long-term health behaviour

change. The NP and other primary care providers are well-positioned to conduct brief counselling interventions over a long term, particularly when practicing from a PHC perspective that includes health promotion in routine practice.

Exercise prescription. The findings of this integrative review provide evidence to support the use of both individualized counselling techniques as well as a tailored exercise prescription (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011; Petrella et al., 2010). This is consistent with the wider literature on exercise prescription (Crookham, 2013). Exercise prescription encompasses providing strategies that involves measuring and prescribing specific amounts of exercise to improve fitness levels and hence improve outcomes of chronic disease (Petrella & Lattanzio, 2002). However, the uptake of exercise prescription in practice is not widespread. For example, a large survey of Canadian primary care physicians found that physicians regularly asked patients about physical activity levels and advised them using verbal counselling, but few respondents provided written prescriptions, performed fitness assessments, or referred patients. These findings suggest possible opportunities to improve exercise prescription efforts (Petrella, Lattanzio & Overend, 2007). Specifically written exercise prescriptions can substantially enhance patient adherence because personalized prescriptions tailor physical activity recommendations to individual needs and goals (Oberg, 2007).

The American College of Sports Medicine (ACSM) and Exercise is Medicine (EIM) recommend treating exercise as a vital sign, and assessing and prescribing physical activity at every medical visit (Crookham, 2013). One way to improve the uptake of exercise prescription is through the use of a framework that could be used by the NP or primary care provider to provide the patient with specific exercise guidelines. Available frameworks

include the FITT principle, and the Exercise is Medicine Canada (EIMC) exercise prescription and referral tool. For example, the FITT principle is a prescription for exercise including frequency, intensity, type and time, which can be used to individualize physical activity recommendations (Jonas & Phillips, 2009).

When applying the FITT principle in the clinical context: Frequency should be prioritized when health goals relate to preventing and managing chronic diseases; Intensity should be considered based on their current condition and planned to ensure maximum impact on weight loss and athletic conditioning; Timing may be considered to account for patient routine, other comorbid conditions (such as diabetes) or medication needs; and Type of exercise should account for available resources and patient preference (Oberger, 2007). Based on the findings of this review, for adults with depression, evidence supports mild to moderate intensity activity since high intensity exercise may have a detrimental effect on mood (Peluso & Guerra de Andrade, 2005, Weinstein et al., 2010). Types of activity can include aerobic activities such as walking, jogging, biking or swimming, though this prescription may also be tailored to other elements of fitness such as strength and flexibility. The FITT principle is further described in Appendix IV, along with other components in assessment of readiness to exercise.

The findings from this study revealed that adults with depression average lower physical fitness and activity levels compared to the general population (Voderholzer et al., 2011; Song et al., 2011). The importance of this is for the primary health care provider to recognize where a patient may be starting from when embarking on physical activity. Primary care providers may have the opportunity to refer patients to fitness professionals within the community for more thorough fitness assessment and prescription. It is within the

scope of practice of a CSEP-Certified Exercise Physiologist or an ACSM-Certified Clinical Exercise Specialist to assess fitness and prescribe exercise to adults with clinical conditions (CSEP, 2007; Jonas & Phillips, 2009); however, there may be limited availability of such services in communities outside of larger metropolitan areas. An even greater barrier to these services is cost to patients, and ability of individuals with MDD to pay for, identify, and access such services.

In all cases, the goals within these frameworks should be realistic, tailored to the individual, and should be based on the SMART models, that is goals that are specific, measurable, attainable, realistic and timely (Jones et al., 2005). This is reflected in the wider body of literature exploring physical activity and supports the conclusion that realistic goal setting is a significant component in adherence to physical activity. For example, in an experimental study exploring psychological factors contributing to adherence to exercise prescription found that in the case of exercise, the authors found that those who have more modest expectations of change tend to come closer to achieving those expected changes, and unrealistically high expectations are correlated with poorer attrition to exercise (Jones, Harris, Waller & Coggins, 2005). The significance of assisting patients with realistic goal setting cannot be underestimated, especially for people with depression since setting unattainable goals may do more harm than good for these patients (Jones et al., 2005). The NP is in an optimal position to use these techniques to counsel and improve adherence to physical activity in patient with depression. Brief health care provider interventions can have significant positive effect on patients' adherence to a plan and maintenance of changes in health behaviours, but caregivers are often too busy to optimally follow up with patients (Ockene et al., 2002). Practical strategies for enhancing exercise adherence with adult

patients in practice are listed in Appendix III. This could reduce the potential devastating consequences associated with a sedentary lifestyle and improve the health outcomes of this high risk group.

The social factor. Adherence to exercise can be influenced through exercise prescription that takes into account both physical and psychosocial considerations. This review collected several studies that found social support to be a significant contributor to physical activity adherence (Allgöwer et al., 2001; DiMatteo, 2004; Oeland et al., 2010; Rogerson et al., 2012). The provision of external influences on adherence to exercise can also not be discounted, such as family, supports, housing, occupation, and environment. Social support is an indisputable asset to exercise adherence, as demonstrated in numerous studies throughout this project (Allgöwer et al., 2001; DiMatteo, 2004; Oeland et al., 2010; Rogerson et al., 2012; Searle et al., 2013). The influence of social support associated with adherence to exercise is paramount and should be a primary focus in physical activity promotion, especially for adults with depression. Enlisting peers, significant others, and committing to a group may all be significant tools for success in adherence. Patients with mild to moderate depression may benefit from being offered structured exercise programming, which of course can be a challenge in accessibility.

Practice Considerations for Primary Care

The findings of the review and the practical lens applied through this discussion section have identified a range of mechanisms and strategies for facilitating adherence to physical activity for those with mild-to-moderate depression; these have including counselling techniques and exercise prescription (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011; Petrella et al., 2010). As identified in the findings of

this review, collaboration with a range of interdisciplinary providers may be key to promoting long-term outcomes in this high-risk population (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Fortier et al., 2011). Findings from the TREAD trial (Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012) and the PAC trial (Fortier et al., 2011) support the collaboration of PHC providers with physical activity counsellors in promoting physical activity at an individualized patient level. The current standard for clinical experts in physical activity counselling in Canada is the Certified Exercise Physiologist (CEP), as certified by CSEP.

The suggested interventions across the reviewed studies had varied levels of success in improving adherence to exercise for adults with depression. Studies that focused on interventions with specialist support proved more successful, though adherence declined when the intervention was concluded (Fortier et al., 2007). Though the strength of the evidence is not robust, increasing exercise adherence is certainly worthwhile in primary health care practice because of the overall health benefits and alignment with Canadian recommendations for exercise. In the primary care setting, exercise professionals are widely unavailable, unaffordable, or not cost-effective (Chalder, Wiles, Campbell, Hollinghurst & Searle, 2012), and so it is important to find strategies that are feasible within current health care systems. Since PHC providers maintain longitudinal relationships with patients, they are in a position for supporting long-term adherence to health behaviours including exercise. Primary health care providers can, without much increase in resources or time, play a long-term role similar to coaches or clinical exercise professionals to facilitate adherence to exercise.

With the widespread accessibility and uptake of daily internet use and email in today's society, it is important to consider the potential role of electronic forms of exercise counselling for use in primary care as a mechanism to increase motivation and adherence to physical activity (Durrani, et al., 2012). The role of electronic counselling may increase as health care evolves with society to use electronic platforms for communication, and the practitioner needs to assess what may be effective for each individual patient. Electronic communication may be especially useful for clients located in rural or remote settings, though it may not be accessible for clients with limited means and resources. However, careful and targeted communication around physical activity requirements and support for uptake is essential for patients with depression. The following section will build on these discussions to provide specific guidelines for practice, education, and research.

Recommendations

The purpose of this project was to explore how the NP can facilitate adherence to physical activity for adults with depression through primary health care in Canada. As part of this review, five themes were identified, they are: links between depression, exercise, and mood; psychosocial elements for physical activity adherence; provider perceptions and practices; targeted physical activity promotion strategies; and physical activity counselling approaches. These were further synthesized and linked to practice and the wider body of literature. Following this process, recommendations were identified for practice, research and education. Integrating these guidelines has the potential to improve the health outcomes of patients with mild-to-moderate depression and to continue to drive education and research initiatives to further build on the development and uptake of approaches and strategies to

facilitate adherence to physical activity. Recommendations for practice, education and research will now be presented.

Recommendations for Practice

Corresponding with the findings of this review, it is essential to have a structured plan for facilitating physical activity with this high risk population. This review has identified the complex and multifaceted nature of this clinical issue, as such I will utilize the 5A's approach to focus and summarize the key practice recommendations arising from this review. The 5A's is one clinical tool recommended for counselling in PHC and lends itself logically to this issue. The tool follows five steps: Ask about, Advise, Agree upon, Assist and Arrange a plan. The 5A's approach can be particularly useful for NPs and other primary health care providers as a structure to facilitate adherence to physical activity with adult patients with depression. This method is systematic and stepwise approach, employing the following sequence (Elford, MacMillan & Wathen, 2001):

- *Step 1: Assess* – The provider first collects, selects and analyses information to make decisions, such as patient readiness for change, determining the patient's goals and objectives.
- *Step 2: Advise* – The provider emphasizes appropriate priorities, targets and rationales for the patient, assisting the patient to make decisions based on knowledge and evidence.
- *Step 3: Agree* – The provider and patient agree on a plan that includes short-term objectives and long term goals, with specific responsibilities and expectations.
- *Step 4: Assist* – The responsibility for action lies with the patient, but the patient should try the agreed upon plan and return to the provider with experiences for discussion and collaborative evaluation.
- *Step 5: Arrange* – It is often necessary to arrange for additional learning or skill development through community services or programs, along with continuous monitoring.

This tool will serve as a framework for presenting a systematic list of recommendations that arose from this integrative review and will seek to delineate practical approaches to facilitating adherence to physical activity in those with mild-to-moderate depression. These

recommendations are intended for NPs in Canada but are applicable to other health providers practicing PHC in Canada or elsewhere. The recommendations are listed in Table 3 and summarized in Appendix V.

Table 3 How nurse practitioners in Canada can facilitate adherence to physical activity for adults with mild to moderate depression through primary health care: the 5A's approach

| Steps | Recommendations | References |
|-------------------|--|---|
| Ask About | <ul style="list-style-type: none"> • Assess history of physical activity and relationship with exercise • Assess barriers and facilitators to exercise and potential strategies, including social supports • Assess stage of behaviour change • Assess baseline health and fitness, consider non-exercise fitness assessment (fit for exercise assessment) • Ask often – make physical activity screening part of every visit, take the time | Allgöwer et al., 2001; Jurca et al., 2005; Plonczynski, 2000; Rogerson et al., 2012; Searle et al., 2013; Voderholzer et al., 2011 |
| Advise on | <ul style="list-style-type: none"> • Educate patients on the benefits and risks of physical activity for health and depressive symptoms • Public health recommendations for physical activity: CSEP.ca/guidelines → 150 minutes per week, >10 minutes per session, 10,000 steps per day • Safe progression – build up time, start at mild and progress to moderate intensity • Provide written copies of advice and resources | Choi, 2007; CSEP, 2013; Peluso and Guerra de Andrade, 2005; Oberg, 2007; Petrella & Lattanzio, 2002 |
| Agree Upon | <ul style="list-style-type: none"> • Respecting the patient's choice (self-determination theory) • SMART goal-setting with short and long-term objectives • Tailored exercise prescription in the format of frequency, intensity, type and time (FITT) | Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Jonas & Phillips, 2009; Jones et al., 2005 |
| Assist | <ul style="list-style-type: none"> • Patient counselling including stage of behaviour change and motivational interviewing • Follow up often, listen to the patient's concerns, challenges and experiences • Share success stories, provide encouragement • Congratulate small successes and avoid criticism of setbacks • Encourage self-monitoring, use exercise logs or pedometers • Refer to community programming if available and | Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Choi, 2007; Fortier et al., 2011; Petrella et al., 2010; Walsh, et al., 1999 |

| | | |
|-----------------------|---|--|
| | affordable <ul style="list-style-type: none"> • Lead by example! Stay active yourself | |
| Arrange a Plan | <ul style="list-style-type: none"> • Review the action plan at every visit and refine according to patient progress • Use structured planning when including other care providers and social supports in the ongoing plan • Use reminder systems, consider electronic communication (telephone, email) | Chalder, Wiles, Campbell, Hollinghurst, Haase, et al., 2012; Durrani, et al., 2012 |

These recommendations take into consideration that NP practice includes a holistic approach to patient care, including developing relationships with patients, identifying patient needs, patient assessment, health promotion, treatment prescriptions, consult and referral, and follow-up. Recommendations for education will be presented.

Recommendations for Education

NPs and health practitioners in general are also expected to maintain continuing education and stay current with their knowledge and skills by accessing current guidelines and following clinical recommendations in practice. Physical activity promotion is as important as any other aspect of PHC for achieving or maintaining health and wellness. Additional education regarding practical health promotion strategies should be added to entry to practice education as well as continuing education. Considering the valuable role of clinical fitness professionals, such as CSEP Certified Fitness Consultants, should be considered within PHC practice.

This project targeted the role of the NP in facilitating adherence to physical activity for adults with mild to moderate depression with a PHC approach in Canada. This project is unique in that it seeks to acknowledge how facilitating adherence to physical activity is distinct for adults with depression from the general population. The project targets NPs as PHC providers with an inherent mandate of patient-centred health promotion. In raising awareness of this issue through education, there is the potential to improve the outcomes of

this high risk and vulnerable population. It is the aim of this author to communicate the outcomes of this review in a peer reviewed manuscript and to present the findings at a relevant conference.

Recommendations for Research

Many of the research papers identified for inclusion in the review were not specific to NP practice or PHC, though the majority of papers carried wide relevance to that practice. A clear definition of exercise or physical activity was often not presented within research studies, nor was there usually a specified definition of adherence. There is a wide array of research demonstrating that adherence to physical activity is a problem for adults with depression, but very few studies assessing how this adherence might be improved. As such, further research is warranted that provides a more systematic examination of this issue and that explores the promotion of physical activity in the PHC context, as opposed to only those in specialist centres or using specialist professional supports. Similarly, expanding the focus of research to include related issues, such as nutrition, may also be of importance.

More research is needed regarding valid non-exercise fitness assessment methods for PHC practice. In addition, further research is still needed to confirm the benefits of physical activity on depression and quantify amounts, types and intensities of exercise that should be recommended. However, several of the findings and recommendations from this project are applicable to all adults in PHC, not just those with depression, and as such may have much wider application than presented here. Further study is also warranted regarding effective counselling techniques and their long-term impact upon physical activity adherence in adults with depression. Given the burgeoning epidemic of obesity, sedentarism, and chronic

conditions, evaluating mechanisms to support adherence to physical activity is of critical importance.

Limitations

Consolidating data for the purpose of this project was met with some limitations in the literature review process. The first limitation was with respect to the selection of data. Only English studies which were electronically indexed and available via databases were included in the research collection. A clear definition of exercise or physical activity was often not presented within research studies, nor was there usually a specified definition of adherence. Many research papers were not specific to NP practice or PHC, though the majority of papers carried wide relevance to that practice. As such, other sources of relevant data may not have been captured. Therefore, there are gaps in the existing literature and as previously discussed, future research is warranted to explore methods for facilitating physical activity adherence for this high risk and vulnerable population. The exclusion criteria utilized for the literature search limited the findings to certain populations with depression, in order to focus the literature to the scope of this project. This may have created some bias in the applications of the findings. The author of this project is a clinical exercise specialist, which may have introduced some bias in the interpretation of the literature and conclusions. Finally, this project assumes that NPs are practicing with a PHC approach, though it must be acknowledged that the scope of NP practice across Canada is varied, as are the work settings of NPs. Consequently, the uptake of the practice recommendations may be restrained by the practice setting and scope of practice.

Conclusion

Depression is a significant problem in Canada. Also of great concern is the declining overall health of Canadian adults, due in great part to sedentary lifestyles. This integrative literature review examined how NPs in Canada can facilitate adherence to physical activity for adults with mild to moderate depression using a primary health care approach to practice. Background knowledge of depression, physical activity and adherence was presented. A comprehensive search of the contemporary literature was undertaken and 15 studies were selected for review. The evidence was critically appraised on the basis of the strengths of the evidence and its relevance to the Canadian health care context. Key findings from this integrative review included reduced baseline fitness and adherence to exercise for adults with depression, positive effects on mood from mild to moderate intensity exercise, challenges in health promotion within primary care, and the need for interdisciplinary approaches, including counselling techniques based on psychological theory, to facilitate adherence to physical activity in those with depression. Recommendations for practice were presented using the 5A's approach and include the need for application of counselling techniques theories, exercise prescription and interdisciplinary approaches to promoting adherence to physical activity. In addition, recommendations for further research that builds upon gaps in the existing literature and examines long-term outcomes were presented as well as recommendations for education that included the need to primary care providers to build upon their knowledge and to follow clinical guidelines and practice recommendations. In conclusion, this project shows that NPs have the capacity to facilitate and improve physical activity adherence for adult patients with depression. This project adds to current literature regarding exercise adherence by focusing on the role of the nurse practitioner, and adding

specific practice strategies that target adults with depression, in order to improve adherence to physical activity and overall health outcomes. This is particularly important in light of the burgeoning impact of obesity, sedentarism, and chronic conditions in Canada today, and in particular for this high-risk and vulnerable population of patients with mild-to moderate depression.

GLOSSARY

All citations from Medical Dictionary (2014) unless otherwise indicated.

adherence: the extent to which patients follow the instructions they are given for prescribed treatments (Bissonnette, 2008)

allostatic load: physiological consequences of chronic exposure to fluctuating or heightened neural or neuroendocrine response that results from repeated or chronic stress

Alzheimer's disease: a degenerative brain disease of unknown cause that is the most common form of dementia, that usually starts in late middle age or in old age, that results in progressive memory loss, impaired thinking, disorientation, and changes in personality and mood, that leads in advanced cases to a profound decline in cognitive and physical functioning, and that is marked histologically by the degeneration of brain neurons especially in the cerebral cortex and by the presence of neurofibrillary tangles and plaques containing beta-amyloid

anandamide: a derivative of arachidonic acid that occurs naturally in the brain and in some foods (as chocolate) and that binds to the same brain receptors as the cannabinoids (as THC)

autonomic nervous system: a part of the vertebrate nervous system that innervates smooth and cardiac muscle and glandular tissues and governs involuntary actions (as secretion, vasoconstriction, or peristalsis) and that consists of the sympathetic nervous system and the parasympathetic nervous system

Beck Depression Inventory (BDI): a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression and is a reliable assessment for the severity of depression (Beck, et al., 1961)

biosynthesis: production of a chemical compound by a living organism

cancer: a malignant tumor of potentially unlimited growth that expands locally by invasion and systemically by metastasis

cannabinoid: any of various chemical constituents, as THC (tetrahydrocannabinol) of cannabis or marijuana

chronic fatigue syndrome: a disorder of uncertain cause that is characterized by persistent profound fatigue usually accompanied by impairment in short-term memory or concentration, sore throat, tender lymph nodes, muscle or joint pain, and headache unrelated to any preexisting medical condition and that typically has an onset at about 30 years of age

chronic obstructive pulmonary disease: pulmonary disease (as emphysema or chronic bronchitis) that is characterized by chronic typically irreversible airway obstruction resulting in a slowed rate of exhalation

circadian: being, having, characterized by, or occurring in approximately 24-hour periods or cycles (as of biological activity or function)

cognitive behavioural therapy: a type of psychotherapy in which negative patterns of thought about the self and the world are challenged in order to alter unwanted behavior patterns or treat mood disorders such as depression (Craft & Perna, 2004)

cortisol: a glucocorticoid $C_{21}H_{30}O_5$ produced by the adrenal cortex upon stimulation by ACTH that mediates various metabolic processes (as gluconeogenesis), has anti-inflammatory and immunosuppressive properties, and whose levels in the blood may become elevated in response to physical or psychological stress

Crohn's disease: chronic ileitis that typically involves the distal portion of the ileum, often spreads to the colon, and is characterized by diarrhea, cramping, and loss of appetite and weight with local abscesses and scarring

diabetes mellitus: a variable disorder of carbohydrate metabolism caused by a combination of hereditary and environmental factors and usually characterized by inadequate secretion or utilization of insulin, by excessive urine production, by excessive amounts of sugar in the blood and urine, and by thirst, hunger, and loss of weight

depression: a mood disorder marked especially by sadness, inactivity, difficulty with thinking and concentration, a significant increase or decrease in appetite and time spent sleeping, feelings of dejection and hopelessness, and sometimes suicidal thoughts or an attempt to commit suicide

endorphin: any of a group of endogenous peptides (as enkephalin and dynorphin) found especially in the brain that bind chiefly to opiate receptors and produce some of the same pharmacological effects (as pain relief) as those of opiates

erectile dysfunction: chronic inability to achieve or maintain an erection satisfactory for sexual intercourse

excessive exercise: dysfunctional exercise behavior in when exercise is undertaken solely to influence weight or shape, or when the postponement of exercise is accompanied by intense guilt, and unlikely to be associated with impairment in psychosocial functioning in the absence of eating disorder psychopathology (Mond, Hay, Rodgers & Owen, 2006)

exercise: a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness (Caspersen et al., 1985)

fitness: a set of attributes that are either health- or skill-related, and the degree to which people have these attributes can be measured with specific fitness tests (Caspersen et al., 1985)

gamma-aminobutyric acid (GABA): an amino acid $C_4H_9NO_2$ that is a neurotransmitter that induces inhibition of postsynaptic neurons

ghrelin: a 28-amino-acid peptide hormone that is secreted primarily by stomach cells with lesser amounts secreted by other cells (as of the hypothalamus), that is a growth hormone secretagogue, and that has been implicated in the stimulation of fat storage and food intake

glucocorticoid: any of a group of corticosteroids (as cortisol or dexamethasone) that are involved especially in carbohydrate, protein, and fat metabolism, that tend to increase liver glycogen and blood sugar by increasing gluconeogenesis, that are anti-inflammatory and immunosuppressive

glutamate: a salt or ester of levorotatory glutamic acid that functions as an excitatory neurotransmitter

haemodialysis: the process of removing blood from an artery (as of a kidney patient), purifying it by dialysis, adding vital substances, and returning it to a vein

HIV (*human immunodeficiency virus*): any of several retroviruses and especially HIV-1 that infect and destroy helper T cells of the immune system causing the marked reduction in their numbers that is diagnostic of AIDS

homeostasis: the maintenance of relatively stable internal physiological conditions (as body temperature or the pH of blood) in higher animals under fluctuating environmental conditions; *also:* the process of maintaining a stable psychological state in the individual under varying psychological pressures or stable social conditions in a group under varying social, environmental, or political factors

Huntington's disease: a progressive neurodegenerative disorder that is inherited as an autosomal dominant trait, that usually begins in middle age, that is characterized especially by choreiform movements, emotional disturbances, and mental deterioration leading to dementia, and that is accompanied by atrophy of the caudate nucleus and the loss of certain brain cells with a decrease in the level of several neurotransmitters

hypertension: abnormally high arterial blood pressure that is usually indicated by an adult systolic blood pressure of 140 mm Hg or greater or a diastolic blood pressure of 90 mm Hg or greater, is chiefly of unknown cause but may be attributable to a pre-existing condition (as a renal or endocrine disorder), that typically results in a thickening and inelasticity of arterial walls and hypertrophy of the left heart ventricle, and that is a risk factor for various pathological conditions or events (as heart attack, heart failure, stroke, end-stage renal disease, or retinal hemorrhage)

immunotherapy: treatment of or prophylaxis against disease by attempting to produce active or passive immunity

inflammation: a local response to cellular injury that is marked by capillary dilatation, leukocytic infiltration, redness, heat, pain, swelling, and often loss of function and that serves as a mechanism initiating the elimination of noxious agents and of damaged tissue

inflammatory bowel disease: either of two inflammatory diseases of the bowel: crohn's disease or ulcerative colitis

insulin: a protein hormone that is synthesized in the pancreas from proinsulin and secreted by the beta cells of the islets of Langerhans, that is essential for the metabolism of carbohydrates, lipids, and proteins, that regulates blood sugar levels by facilitating the uptake of glucose into tissues, by promoting its conversion into glycogen, fatty acids, and triglycerides, and by reducing the release of glucose from the liver, and that when produced in insufficient quantities results in diabetes mellitus

leptin: a peptide hormone that is produced by fat cells and plays a role in body weight regulation by acting on the hypothalamus to suppress appetite and burn fat stored in adipose tissue

magnetic resonance spectroscopy: a noninvasive technique that is similar to magnetic resonance imaging but uses a stronger field and is used to monitor body chemistry (as in metabolism or blood flow) rather than anatomical structures

metabolic syndrome: a syndrome marked by the presence of usually three or more of a group of factors (as high blood pressure, abdominal obesity, high triglyceride levels, low HDL levels, and high fasting levels of blood sugar) that are linked to an increased risk of cardiovascular disease and type 2 diabetes

monoamine: an amine RNH_2 that has one organic substituent attached to the nitrogen atom; *especially* : one (as serotonin) that is functionally important in neural transmission

motivational interviewing: a directive, client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence, defined not by technique but by its spirit as a facilitative style for interpersonal relationship (Rollnick & Miller, 1995)

multiple sclerosis: a demyelinating disease marked by patches of hardened tissue in the brain or the spinal cord and associated especially with partial or complete paralysis and jerking muscle tremor

myocardial infarction (*heart attack*): an acute episode of heart disease marked by the death or damage of heart muscle due to insufficient blood supply to the heart muscle usually as a result of a coronary thrombosis or a coronary occlusion and that is characterized especially by chest pain

neurotrophic: relating to or dependent on the influence of nerves on the nutrition of tissue

nurse practitioners: health professionals who have achieved advanced nursing practice competencies at the graduate level of nursing education, to provide health care services from a holistic nursing perspective, integrated with the autonomous diagnosis and treatment of acute and chronic illnesses, including prescribing medications, within their legislated scope of practice (CRNBC, 2011b)

obesity: a condition that is characterized by excessive accumulation and storage of fat in the body and that in an adult is typically indicated by a body mass index of 30 or greater

osteoporosis: a condition that affects especially older women and is characterized by decrease in bone mass with decreased density and enlargement of bone spaces producing porosity and brittleness

overtraining syndrome: the point at which an athlete exceeds his/her capacity for exercise, with both psychological and physiological components (Johnson & Thiese, 1992)

oxidative stress: physiological stress on the body that is caused by the cumulative damage done by free radicals inadequately neutralized by antioxidants and that is held to be associated with aging

Parkinson's disease: a chronic progressive neurological disease chiefly of later life that is linked to decreased dopamine production in the substantia nigra and is marked especially by tremor of resting muscles, rigidity, slowness of movement, impaired balance, and a shuffling gait

PHQ-9 (*Patient Health Questionnaire*): a self-administered version of the PRIME-MD (Primary Care Evaluation of Mental Disorders) diagnostic instrument for common mental disorders, the depression module (Kroenke, Spitzer, & Williams, 2001)

pharmacotherapy: the treatment of disease and especially mental disorder with drugs

physical activity: any bodily movement produced by skeletal muscles that results in energy expenditure, and can be categorized in daily life into occupational, sports, conditioning, household, or other activities (Caspersen et al., 1985)

postpartum (*postnatal*) depression: moderate to severe depression in a woman after she has given birth, which may occur soon after delivery or up to a year later and most often occurring within the first 3 months after delivery

primary care: the delivery of community-based clinical services focused on diagnosis, treatment and management of health conditions as well as health promotion and disease prevention (CNA, 2012b)

primary care practitioner: practitioner that delivers primary care, in Canada a primary care physician or nurse practitioner

primary health care: a principle-based and comprehensive approach that aims to strengthen health systems and improve population health; it is promotive, preventive, curative, restorative, rehabilitative and palliative (CNA, 2012b)

psoriasis: a chronic skin disease characterized by circumscribed red patches covered with white scales

rheumatoid arthritis: a usually chronic disease that is considered an autoimmune disease and is characterized especially by pain, stiffness, inflammation, swelling, and sometimes destruction of joints

sedentary: doing or requiring much sitting : characterized by a lack of physical activity

self-determination theory: a theory of motivation concerned with supporting our natural or intrinsic tendencies to behave in effective and healthy ways, which rests on a human ethic and reflects a psychological reality that people should have the freedom of choice (Corrigan et al., 2012)

self-efficacy: a measure of one's own ability to complete tasks and reach goals (Plonczynski, 2000)

serotonin (*5-HT*, *5-hydroxytryptamine*): a phenolic amine neurotransmitter $C_{10}H_{12}N_2O$ that is a powerful vasoconstrictor and is found especially in the brain, blood serum, and gastric mucous membrane of mammals

social cognitive theory: a multifaceted approach that addresses the personal and socio-structural determinants of health and the reciprocal interplay between self-regulatory and environmental determinants of health behavior; people's beliefs in their collective efficacy to accomplish social change play a key role in the policy and public health approach to health promotion and disease prevention (Bandura, 1998)

stroke: sudden diminution or loss of consciousness, sensation, and voluntary motion caused by rupture or obstruction (as by a clot) of a blood vessel of the brain

systemic lupus erythematosus: an inflammatory connective tissue disease of unknown cause that occurs chiefly in women and that is characterized especially by fever, skin rash, and arthritis, often by acute hemolytic anemia, by small hemorrhages in the skin and mucous membranes, by inflammation of the pericardium, and in serious cases by involvement of the kidneys and central nervous system

testosterone: a male hormone that is a crystalline hydroxy steroid ketone $C_{19}H_{28}O_2$ produced primarily by the testes or made synthetically and that is the main androgen responsible for inducing and maintaining male secondary sex characteristics

transtheoretical model (*stages of change model*): a theory in which behaviour change is conceptualized as a process that unfolds over time and involves progression through a series

of five stages: precontemplation, contemplation, preparation, action, and maintenance (Plonczynski, 2000)

ulcerative colitis: a chronic inflammatory disease of the colon that is of unknown cause and is characterized by diarrhea with discharge of mucus and blood, cramping abdominal pain, and inflammation and edema of the mucous membrane with patches of ulceration

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Appendix I

Counselling Models for Facilitating Adherence to Physical Activity

| Counselling Model | Theoretical Concepts | Practice Considerations |
|---|--|--|
| Stages of Change Model (SCM) (Plonczynski, 2000) | <ul style="list-style-type: none"> • Behaviour change is a process that unfolds over time • Progression through five stages: pre-contemplation, contemplation, preparation, action, maintenance. • Adhering to exercise would be in the action or maintenance phases, which is the goal of adherence | <ul style="list-style-type: none"> • Individuals may move through the stages of change in a linear or cyclical manner • Often reversion to prior stages in the process, and always the risk of relapse into sedentarism • Assessing stage of change is the first step of assessing readiness for exercise |
| Self-Determination Theory (SDT) (Corrigan et al., 2012; Teixeira et al., 2012) | <ul style="list-style-type: none"> • A theory of motivation concerned with supporting our natural or intrinsic tendencies to behave in effective and healthy ways, which rests on a human ethic and reflects a psychological reality that people should have the freedom of choice • There is good evidence for SDT in understanding exercise behaviour | <ul style="list-style-type: none"> • The key in practitioner-patient relationship is <i>informed</i> choice, complete with understanding. • The informed choice of concern is the choice to exercise, with the desired outcome of improving health |
| Social Cognitive Theory (SCT) (Bandura, 1998; McAuley, 1992) | <ul style="list-style-type: none"> • A multifaceted approach that addresses the personal and socio-structural determinants of health and the reciprocal interplay between self-regulatory and environmental determinants of health behavior • Self-efficacy is a measure of one's own ability to complete tasks and reach goals • Self-efficacy is intrinsically linked to motivation, and as the adhering to exercise becomes more difficult self-efficacy plays a more important role | <ul style="list-style-type: none"> • People's beliefs in their collective efficacy to accomplish social change play a key role in the policy and public health approach to health promotion and disease prevention • The individual with greater self-efficacy is more likely to adhere to sufficient regular exercise • Health care providers such as NPs play a role in motivating patients |
| Motivational Interviewing (MI) (Hettinga, Steele & Miller, 2005; Rollnick & Miller, 1995) | <ul style="list-style-type: none"> • A directive, client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence • Differentiated into two phases: the first focused on increasing motivation for change, and the second on consolidating commitment | <ul style="list-style-type: none"> • Widely used as a method for health promotion and physical activity counselling among a variety of health and wellness practitioners • Defined not by technique but by its spirit as a facilitative style for interpersonal relationship |

Appendix II

The Transtheoretical Model: Patient Perceptions and Role of the Health Care Provider
based on content from Norcross, Krebs, and Prochaska, 2011

| STAGE OF CHANGE | What happens during each stage: | Patient perceptions and challenges: | Potential role of the health care provider: |
|-------------------------|---|--|--|
| Precontemplation | The patient has no intention to change behaviour in the foreseeable future | Pre-contemplators are unaware or under-aware of their problems, however peers may be well aware that the patients suffers from the problems | Nurturing parent – joining with the resistant and defensive patient, developing a respectful relationship |
| Contemplation | The patient is aware that a problem exists and is seriously thinking about overcoming it but has not yet made a commitment to take action | Contemplators struggle with their positive evaluations of their dysfunctional behaviour and the amount of effort, energy, and loss it will cost to overcome it | Socratic teacher – encouraging the patient to achieve their own insight into their condition |
| Preparation | The patient intends to take action in the next month and is reporting some small behavioural changes (“baby steps”) | Preparing patients have not yet reached the criterion for effective action | Experienced coach – provide a fine game plan or review the patient’s own game plan |
| Action | The patient has successfully altered the dysfunctional behaviour for a period of 1 day to 6 months | The patient modifies behaviour, experiences, and/or environment to overcome the problem(s) in the most overt stage of change, requiring considerable commitment of time and energy | Consultant – available to provide expert advice and support when action is not progressing smoothly |
| Maintenance | The patient is remaining free of the problem and/or consistently engaging in the new behaviour for more than 6 months | Patients work to prevent relapse and consolidate the gains attained during action | In lengthy provider relationships consulting is less often as the patient experiences greater autonomy and ability to live free from previously disabling problems |

Appendix III

Linking Motivation, Self-efficacy and Intention

(Plonczynski, 2000)

| | |
|----------------------|---|
| Motivation | <ul style="list-style-type: none"> • The primary goal for health care providers promoting lifestyle modification is the facilitation of the individual's internal motivation • Motivation may be defined as the intrinsic determination toward goal attainment • Motivation is concerned with initiation as well as maintenance of a behaviour • Motivation is at the crux of health behaviour performance and thus, to a great extent, health • Motivation is an antecedent to exercise |
| Self-efficacy | <ul style="list-style-type: none"> • Self-efficacy is the best known predictor of health behaviour, yet there is more to motivation than self-efficacy • Self-efficacy is defined as confidence and is a good predictor of intention • Self-efficacy is the primary mediator of change in behaviour, and this is mediated through cognition • Cognition is seen as mediating an initial change from which evolves success and subsequent self-efficacy |
| Intention | <ul style="list-style-type: none"> • Individual attitudes and social norms are accurate predictors of intentions • Intention is a significant indicator of a behaviour's performance |

Strategies for Practice to Facilitate Exercise Adherence

(Ockene, et al., 2002)

Primary health care providers should, at a minimum:

- Promote regular physical activity by taking a physical activity history
- Provide pamphlets/advice regarding general principles of physical activity
- Recommend 30 minutes per day of regular, moderate-intensity activity

Additional recommendations to enhance counselling adherence included:

- Simplify the regimen
- Tailor the regimen to the patient's lifestyle and needs
- Ask the patient about adherence at every visit
- Have the patient bring an exercise log for review
- Involve the patient as a partner in the treatment process
- Provide clear written and oral instructions
- Use behaviour strategies such as reminder systems, cues, self-monitoring, feedback and reinforcement

Appendix IV

Assessing Readiness for Exercise and Exercise Planning

Cardiorespiratory Fitness (Stamatakis et al., 2012)

Calculate non-exercise test of cardiovascular fitness using the following equation:

$$\text{NET-F (METs)} = [(\text{sex coefficient} \times 2.78) - (\text{age} \times 0.11) - (\text{BMI} \times 0.17) - (\text{RHR} \times 0.05) - (\text{physical activity level coefficient}) + 21.41] = \text{maxMETs}$$

...where:

- NET-F = non-exercise test of cardiorespiratory fitness
- MET = metabolic equivalent of VO_2max (maxMETs = maximum threshold)
 - 1 MET corresponds to an oxygen consumption of 3.5 mL/kg/min (based on a 70 kg man age 40 years), and is roughly equivalent to the energy cost of sitting quietly.
- Sex coefficient = 1 for men, 0 for women
- BMI = body mass index = kg/m^2
- RHR = resting heart rate = beats per minute
- Physical activity level coefficients: (MVPA = moderate-to-vigorous physical activity)

| Level | Physical activity | Coefficient |
|-------|---|-------------|
| 1 | inactive (no physical activity of any intensity reported) | 0.00 |
| 2 | regular domestic activity only or <1.5 MVPA sessions/week | 0.35 |
| 3 | 1.5 to <3 MVPA sessions/week | 0.29 |
| 4 | 3–6 MVPA sessions/week | 0.64 |
| 5 | >6 MVPA sessions/week | 1.21 |

Training Intensity

Calculating an appropriate training intensity:

$$\text{Training METs} = [(\text{appropriate \% intensity}) + \text{maxMETs}] / 100 \times \text{maxMETs}$$

Appropriate intensity: For aerobic training, dose of exercise should vary from 40% of maxMETs for poorly conditioned and/or symptomatic persons up to 85% of maxMETs for well-conditioned athletic persons. A training intensity of 60-70% of maxMETs, the average level of anaerobic threshold, is typically prescribed for most healthy, asymptomatic individuals when performing continuous aerobic training. (Jetté, Sidney & Blümchen, 1990)

Various physical activities and energy consumed in METs per hour (Ainsworth et al., n.d.)

| Activity | METs/hr | Activity | METs/hr |
|-----------------------------------|---------|-----------------------|---------|
| Walking slowly, less than 2 mph | 2.0 | Shoveling snow | 6 |
| Gardening, light | 2.0 | Strenuous hiking | 6–7 |
| General house cleaning | 3.0 | Rowing or kayaking | 6–8 |
| Walking briskly, 3 mph | 3.3 | Skiing, downhill | 6–8 |
| Heavy yard work or gardening | 4.0 | Bicycling, 10–16 mph | 6–10 |
| Climbing stairs | 4.0 | Aerobic calisthenics | 6–10 |
| Bicycling casual less than 10 mph | 4.0 | Singles tennis | 7–12 |
| Dancing (ballet or modern) | 4.8 | Swimming, crawl, slow | 8.0 |
| Snorkeling | 5.0 | Running, 8 mph | 13.5 |
| Mowing lawn with hand mower | 5.5–6.0 | | |

The FITT Principle for Physical Activity Prescription (Barkley, 2010)

| Principle: | Explanation: | Example (meeting adult guidelines): |
|------------------|------------------------------|-------------------------------------|
| Frequency | number of sessions per week | 5 days per week |
| Intensity | level of exertion | moderate |
| Type | type of exercise activity | walking, level surface |
| Time | duration of exercise session | 30 minutes |

Appendix V

The 5A's Approach:

How nurse practitioners in Canada can facilitate adherence to physical activity for adults with mild to moderate depression through primary health care

| Steps | Recommendations |
|-----------------------|--|
| Ask About | <ul style="list-style-type: none"> • Assess history of physical activity • Assess stage of behaviour change, readiness for exercise • Assess barriers and facilitators to exercise and potential strategies, including social supports • Ask often – every visit! |
| Advise on | <ul style="list-style-type: none"> • Educate patients on the benefits and risks of physical activity for health and depressive symptoms • Public health recommendations for physical activity: CSEP.ca/guidelines → 150 minutes per week, >10 minutes per session, 10,000 steps per day • Safe progression – build up time, start at mild and progress to moderate intensity • Provide written copies of advice and resources |
| Agree Upon | <ul style="list-style-type: none"> • Respecting the patient's choice (self-determination theory) • SMART goal-setting with short and long-term objectives • Tailored exercise prescription in the format of frequency, intensity, type and time (FITT) |
| Assist | <ul style="list-style-type: none"> • Patient counselling including stage of behaviour change and motivational interviewing • Follow up often, listen to the patient's concerns, challenges and experiences • Share success stories • Congratulate small successes and avoid criticism • Encourage self-monitoring such as exercise logs • Refer to community programming • Lead by example! Stay active yourself |
| Arrange a Plan | <ul style="list-style-type: none"> • Review the action plan at every visit and refine according to patient progress • Use structured planning when including other care providers and social supports in the ongoing plan • Use reminder systems, consider electronic communication |