INVESTIGATING SOCIAL SUPPORT, HEALTH AND GENDER AS DETERMINANTS OF PHYSICAL ACTIVITY FOR 55 – 70 YEAR OLD ADULTS

A thesis presented in partial

fulfillment of the requirement for the degree of

Master of Arts in Health Psychology

at Massey University, Palmerston North, New Zealand

Vicki Margaret Beagley

2008

ABSTRACT

Our global populations have low physical activity levels, which are leading to burgeoning health issues. International literature portrays New Zealand as an active nation in comparison to other western nations, yet physical activity levels are declining world wide, as well as in New Zealand. Approximately 47% of New Zealand males and 43% of New Zealand females aged from 55 to 70 years are not active enough. This study utilized an ecologically based model to investigate gender, social support, physical and mental health, in relation to levels of physical activity. The 6,413 participants were part of a nationwide cross sectional study and the analyses conducted included bivariate, mediating and moderating relationships. All the proposed hypotheses were supported, except for the moderation hypothesis. Therefore the results of this study, which is the first in New Zealand to consider these relationships, highlights the importance of social support and health when examining physical activity participation. Further research in New Zealand is now required to identify those determinants that explain even more variance in physical activity, with a view to developing effective interventions.

ACKNOWLEDGEMENTS

Thanks firstly to my supervisor Dr Chris Stephens, for her knowledge, guidance and support. I am especially grateful too for her understanding and patience during the development and eventual fruition of this thesis. Thanks also must go to those 6,413 participants who gave freely of their time to complete the questionnaire.

Thanks to those too who have supported and inspired me along the way, Inga for her wise counsel, Jack for his SPSS support and the final proof reading, and to my fellow students in the post grad room. Many times we felt overwhelmed by the tasks before us, but with mutual support and understanding, we have supported each other to completion.

Finally many thanks to my husband John - the academic journey to post graduate level has taken eight years. Your support and understanding has been crucial to me. Also, to our children, Callum (17), Brianna (15) and our twins, Braedyn and Cameron (11), you have never known a "Mum" without a textbook in hand. Maybe now I can read Harry Potter. I hope I have inspired you to take every educational opportunity you can.

TABLE OF CONTENTS

CHAPTER FOUR: PHYSICAL ACTIVITY DETERMINANTS

CHAPTER FIVE: THE PRESENT STUDY AND HYPOTHESES

CHAPTER SIX: METHODS

CHAPTER SEVEN: RESULTS

CHAPTER EIGHT: DISCUSSION

LIST OF TABLES

LIST OF FIGURES

APPENDIX

CHAPTER ONE: INTRODUCTION

1.1 General Overview

Chronic illnesses, such as heart disease, strokes, cancer, chronic respiratory diseases and diabetes, are the leading cause of mortality today, and these illnesses represent 60% of all recorded deaths (WHO, 2007). Obesity is also of epidemic proportions world wide, compounded by the knowledge that many significant ailments result from obesity. New Zealand, like many other OECD countries, is currently experiencing a decline in fertility, an increase in life expectancy and an ageing of the baby boomers. Combined, these factors have lead to an aging population. With this phenomenon comes an increase in those with functional disabilities. In 2001, 12% of the New Zealand population was aged 65 and over, but by 2026, the estimated proportion will be 19% (Wang, Walls, Blakey, & Green, 2006). A continued increase in the proportion of older people can produce an overburdened health system. As a result, many support and health practices have been developed to cope with burgeoning health issues and some researchers and practitioners are seeking a more holistic method with a view to successfully coping with the extra health demands. Along these lines, Mazzeo et al. (1998) and Peel, McClure, and Bartlett (2005) have noticed a shift in thinking toward "Healthy Aging". This approach does not look at health outcomes per se, but at healthy people to identify just what factors are present in their lives, that contribute to their good health. Therefore by identifying these factors, preventative measures can be sought. Amongst these factors is physical activity.

In ancient Greece and China, exercise was encouraged as a means of improving health (Marks, Murray, Evans, & Willig, 2002). But the first actual documented academic support for the benefits of physical activity was by John Morgan in 1873. Marks et al. further advise Morgan studied the longevity of oarsmen in the annual Oxford and Cambridge boat race and concluded that the participants would live on average, 2.2 years longer than those who did not participate. Of more recent times, Jean Mayer in 1953 conducted trials with laboratory mice and he too concluded activity was beneficial for health (Taubes, 2008). Over thirty years later, the same call was made (Paffenbarger, Hyde, Wing, Lee, & Kampert, 1986), due to a noted reduction in physical activity participation. Murray and Lopez (2002), O'Brien-Cousins (2005) and the US Surgeon General Audrey Manning, USDHSS (1996), acknowledged also, that the levels of sedentariness actually differed with age.

Most nations have ignored the advice on the various benefits and few risks associated with physical activity (Sherwood & Jeffery, 2000; USDHSS, 1996), therefore leading to an international reduction in the amount of physical activity participation. Even though stakeholders and researchers worldwide have publicized their positive findings, many of our populations have remained sedentary, and many who had been active, have actually reduced their activity levels (USDHSS, 1996; van Alst et al., 2002). Societal changes have contributed to increased sedentary behaviour, and amongst these changes are increasingly busy, mechanized and computerized lives.

Age appeared to be an important factor when examining the levels of physical activity, as empirical research suggested levels not only varied with age (Murray & Lopez, 2002; Pretty, Griffin, Sellens, & Pretty, 2003; Sheppard, Senior, Park, Mockenhaupt, Chodzko-Zajko, & Bazzarre, 2003; USDHSS, 1996; van Alst, Kazakov, & McLean, 2002; Weiss, 2004) but they also reduced with age (Duncan, Duncan, & Stryker, 2005). Yet, physical activity was found to improve the quality of life for any age group (Levielle, Guralnik, Ferucci, & Langlois, 1999). The most recent census conducted in New Zealand, advised females could now expect to live until 81.9 years and males until 77.9 years (Statistics New Zealand, 2007), an increase since the previous census, of .2 of a year for women and .4 for men. Therefore, due to this increased longevity, as previous exercise predicts future exercise (Duncan et al., 2005; Rhodes et al., 1999), physical activity should be incorporated into our lives on a regular basis. This decline in physical activity levels has lead to a reduced quality of life and to increased health problems (O'Brien-Cousins, 2000; Pratt, Macera, Sallis, O'Donnell, & Frank, 2004). Our populations need to know, that any increase in physical activity participation would ameliorate, or protect individuals from many health ailments. In New Zealand, although participation levels were higher than those identified internationally, the current message from Sport and Recreation New Zealand (SPARC), is for everyone to be active for at least thirty minutes per day on at least five days per week (van Alst et al., 2002).

This thesis intends to research the determinants that lead to physical activity participation for those aged 55 to 70 years of age. The variables chosen were health, social support and gender, as empirical research supported the link between these variables and physical

activity levels. Support for the validity of these variables is illustrated in chapter four. The data for this research document is from the Health, Work and Retirement Study (HWR Study) that is currently being conducted by the Psychology Department at Massey University. Although, preliminary research from the HWR Study has been published (see Alpass et al., 2007; Stephens et al., 2007), this is the first in depth investigation into the variables noted above. This thesis will also contribute to the growing literature on the importance of health, social support and gender on physical activity participation.

Many theories have previously been utilised to investigate physical activity, but growing recent support for an ecologically based approach has been noted (Bauman, Sallis, Dzewaltowski, & Owen, 2002; Satariano & McAuley, 2003; Trost, Owen, Bauman, Sallis, & Brown, 2002). To date, this approach, which uses broader determinants, has not been utilised in New Zealand.

Chapter two begins by considering the levels of physical activity in New Zealand and then internationally, as well as considering the benefits, risks, barriers and motivators that are central to physical activity.

CHAPTER TWO: PHYSICAL ACTIVITY PARTICIPATION

Introduction

This chapter discusses the levels of physical activity in New Zealand, and then compares the results with those of other western nations. Thereafter, the inherent benefits and risks involved in physical activity participation are discussed. Finally, barriers and motivators are considered, with a view to discovering the central variables important to physical activity levels.

2.1 Physical Activity in New Zealand

In New Zealand, we pride ourselves on being clean and green, and with this mantra is the subliminal message that we are therefore a fit, active and healthy nation. We only have to mention hallowed names such as the late Sir Edmund Hillary, Sir Peter Snell and the All Blacks for confirmation. This notion is bolstered, by the climatic and geographic advantages that make physical activity possible in both winter and summer. However, statistical information from SPARC has informed our nation of the low levels of physical activity participation (van Alst et al., 2002). Researchers conducted a relatively recent study that compared 15 – 16 year olds in New Zealand and in Scotland. New Zealand teenagers were found to have higher levels of physical activity (West, Reeder, Milne, & Poulton, 2002). Therefore, although this comparative information with Scotland is useful, the results are relative, as van Alst et al. found in the same year, that just 68% of New Zealanders under 18 years were active. In light of the growing knowledge that activity levels are decreasing, initiatives to increase physical activity have been

developed for those still at school. An "Active Schools" policy to encourage our school children to be more active has recently been implemented. This policy has given guidance and support for teachers to include at least fifteen minutes of physical activity into their daily plan. Therefore, although policies have been developed to increase activity levels for the younger generation; to date no national policies are in place to increase physical activity participation for adults.

The recent census stated adult activity levels were 68%, the same as for those under 18 years of age. For those aged 50 - 64, activity levels were 71% but started to decline thereafter to 70%. Of the general population, 10% were sedentary (Carr, 2001) but this number doubles once the age of 50 is reached. This international trend that physical activity declines as a person ages, is well documented (Dishman, 1994; Prohaska et al., 2006). Traditionally, New Zealand has tended to follow international trends, and whilst sometimes detrimental, early warning of the low levels of physical activity and increasing health issues overseas can be beneficial. New Zealand has the chance to be proactive and to curb this downward trend by developing beneficial interventions. These low levels drove the Regional Sports Trusts to devise initiatives such as "Push Play" to encourage all New Zealanders to be active for at least thirty minutes on at least five days per week. These guidelines were adopted directly from the 1996 American General Surgeon's Report (USDHSS, 1996). However Bauman et al. (2003) who have been extensively involved in the "Push Play" campaign noted for physical activity to increase, the campaigns need to be sustained over a number of years. As a result, it may be some years before real and lasting increases in physical activity are noted. But any increase

must be applauded, as any activity at all is beneficial (Booth, Owen, Clavisi, & Leslie, 2000; Carr, 2001; Marks, Murray, Evans, & Willig, 2000). One initiative that encourages increases in physical activity has emanated from the United Kingdom. The Green Prescription Scheme which supports the public health message to promote more physical activity and less medication (Pretty et al., 2003) has been adapted for New Zealand use, and has many health professionals and regional sports trusts working in partnership.

2.2 Physical Activity and Other Nations

The World Health Report "2002 – Reducing Risks, Promoting Healthy Life" (Murray & Lopez, 2002) estimated 17% of the world's population was sedentary and 41% were insufficiently active. In comparison, relatively recent surveys have noted that 32% of New Zealanders are insufficiently active (Carr, 2001; van Alst et al., 2002).

In North America, a then "ground-breaking" report by the US Surgeon General, Audrey Manning, (USDHSS, 1996), painted a grim picture of the declining levels of physical activity. As a result, Manning recognised the need to make physical activity an essential health objective. A recent survey (Duncan et al., 2005), suggested a quarter of the world's western population was inactive, and Prohaska et al. (2006) noted physical activity levels were lower for older adults, as less than 30% met the required guidelines. The situation was no better in Canada, as Rhodes et al. (1999) noted 40% of the adult population did no exercise at all. Researchers in Europe concurred, as Pretty et al. (2003) noted declining levels of physical activity, particularly for those entering their retirement years. In the United Kingdom, just 32% of adults were moderately active at least five

times per week. Australia, the country most similar to New Zealand, had activity rates much lower than New Zealand, as just 57% of adults were active and 15% were sedentary (van Alst et al., 2002).

In summary, locally and internationally, although the benefits of physical activity are well known, our populations are becoming more sedentary, but New Zealand compares favourably, with 68% of our population being physically active. Initiatives are being developed, but there is still the need to investigate further ways that the decline in physical activity can be halted. The following sections consider the benefits and the risks of physical activity.

2.3 Benefits

Physical activity improves chronic ailments, with the benefits far outweighing any risks (Bandura, 1998; Dishman et al., 2005; Giles-Corti & Donovan, 2002; McAuley et al., 2003; O'Brien-Cousins, 2005; Resnick, 2001; Springer, Kelder, & Hoelschler et al., 2006; Weiss, 2004). The following three sections identify and discuss the biological, social and psychological benefits of physical activity.

2.3.1 Biological

The biological benefits of physical activity are too extensive to include in this section, however, some examples do follow. Those who are sedentary double their risk of premature death (Ferrucci, Izmirlian, Phillips, Corti, & Brock, 1999; Pretty et al., 2003; Sundquist, Qvist, Sundquist, & Johansson, 2004), and are twice as likely to live with a

disability (Levielle et al., 1999). Yet, physical activity is beneficial, as those with a chronic disability or arthritis can have improved mobility (Stewart et al., 2001), which in turn leads to an improved quality of life (Shih, Hootman, Kruger, & Helmick, 2006). Consequently, the improvement in mobility then allows the individuals to be more active and less likely to fall or injure themselves. One of the major health problems in the world today is obesity, yet physical activity is able to reduce obesity (Stewart et al., 2001). Obesity is linked to many health ailments, particularly type II diabetes which affects 20% of Māori and Pacific Island peoples, and 6% of the rest of the population (Gilmour & Snell, 2006). Manson and Spelsberg (1994) reported between 30 – 50% of newly assessed type II diabetes, were preventable as they occurred as a direct result of sedentariness. Physical activity also aids the reduction in the morbidity and mortality associated with diabetes (Burchfiel et al., 1995; Sundquist et al., 2004). Early research noted by Gilmour and Snell also indicated an apparent protective effect for both diabetes and some cancers. Whilst the actual physiological reasons for these benefits are unknown, empirical evidence is clear and compelling. A lack of exercise is also an important risk factor for coronary heart disease (Gilmour & Snell, 2006; Petosa, Suminski, & Hortz, 2003), and can raise the risk of strokes (Hakim et al., 1999; Lee, Hennekens, Berger, Buring, & Manson, 1999). Even wound healing can be vicariously improved by physical activity (MacAuley, 1999), as can the incidence and seriousness of fractures and falls (Welsh & Rutherford, 1996; Mazzeo et al., 1998).

In summary, the biological benefits of physical activity are wide-ranging, and can reduce the impact of chronic ailments, aid recovery and even provide a protective effect. The

benefits though are not just biological, as research has also documented the benefits within the social domain.

2.3.2 Social

Many varied studies have confirmed the beneficial relationship between physical activity and the social domain. Amongst these was a study that identified a positive link between physical activity, well-being and social support (Krawczynski & Olszewski, 2000). Those who were physically active were much happier and had higher levels of social support and well-being. These beneficial aspects can be apparent post intervention also, as Li, Fisher, Harmer, and McAuley (2002) noted with their own study, increased feelings of well-being could continue for up to six months. Improved positive affect and energy levels have also been identified, particularly as a person ages (Deiner, 1984), as well as an improved level of independence (Lee & Park, 2006). In the latter study, the intervention group was five times more likely to recover from a disabling event. Physical activity appears to make people feel happier, which in turn leads to increased confidence and stronger social relationships. Sport in particular has helped different cultures to socially assimilate, by allowing a common denominator of acceptance. Sport is an invaluable way of socialising in a non-threatening environment, with the overall effect of encouraging social participation in society. This is particularly important for those in the older age groups, as social contacts do decline with age (Rhodes et al., 1999). Recreation provides a key for our communities to strengthen social cohesion and social capital, thereby strengthening social ties and community networks. This leads to increased trust amongst members, which also encourages social interaction.

Having identified various biological and social benefits of physical activity, the next section discusses the benefits in the psychological domain.

2.3.3 Psychological

Pretty et al. (2003) noted physical activity improved mental health. The importantance of this finding cannot be underestimated, as mental and behavioural disorders are estimated to be 13% of the global burden of disease (Saxena, van Ommeren, Tang, & Armstrong, 2005). Amongst these disorders is depression, a chronic and pervasive ailment that is increasingly prevalent (Kessler, 2003). Mazzeo et al. (1998) stated 15% of the older adult population claim to be depressed, and Jones (2003) asserted women were disproportionately affected by depression, and other mood disorders. As a result, much work has been conducted in this area, and encouraging research has shown physical activity can reduce the risk of depression (Stephens, 1988) and the actual symptoms of depression (Lawlor & Hopker, 2001; Pretty et al., 2003; Saxena et al., 2005; Singh, Clements, & Fiatarone Singh, 2001; Yael, Meng-Jia, Becker, & Gershon, 2005). Saxena et al. further bolstered general support for the specific benefits, as they found physical activity could reduce the length of hospitalization for those with chronic mental disorders. They also identified health benefits for phobias, generalized anxiety disorder and panic attacks, and a reduction in the actual incidence of mental illness. However, disorders such as schizophrenia, bipolar and substance dependence did not improve, but they did suggest the actual overall quality of life did improve. The knowledge that stress levels were reduced by physical activity supports the inclusion of physical activity in the treatment regimes for stress and other mental health ailments (MacAuley, 1999).

Reaction times were also shown to improve with an intervention based on physical activity (McMurdo & Rennie, 1993), as well as a possible protective effect for alzheimers disease (Fabrigoule, 2002; O'Brien-Cousins, 2000), but further research is required to ascertain any direct, enduring link.

In summation, physical activity not only helped psychological ailments and cognitive ability but a protective effect was also apparent. Although the documented benefits of physical activity are many and varied, there can be some inherent risks which are now discussed.

2.4 Risks

In contrast to the many benefits as discussed above, there are few documented risks associated with physical activity. Although there is a dearth of research in this area, some studies do provide an insight into the specific risks that can occur as a result of physical activity.

2.4.1 Injury

When any physical activity is considered, the individual must be aware of the importance of preparation, particularly if the individual has been sedentary for a period of time. Musculoskeletal injuries are the most common with any physical activity, but these injuries, tend not to be serious, and generally occur in the first few weeks of training (O'Brien-Cousins, 2000; Sallis, 1999). Many of these injuries are preventable, and a sensible approach to the level and type of physical activity can markedly reduce their

incidence (Jacobson, Strohecker, Compton, & Katz, 2005; Sherwood & Jeffery, 2000). In contrast, excessive exercise, particularly from a young age can result in maturational problems, especially for bone growth. Also, the induced low bone density that can result, can lead to an increased risk of osteoporosis, arthritis and fractures in later life (Rutherford, 1997). And lastly, against popular anecdotal theory, death as a direct result of physical activity is rare, as O'Brien-Cousins suggested other underlying often undiagnosed conditions are usually the cause.

2.4.2 Safety

Personal safety was also a risk factor, predominantly for those who run or cycle near to or on the roads. The seasons had a direct affect on participation also, as women in particular (Burton, Shapiro, & German, 1999) preferred to exercise less in winter, due to the reduction in day light hours and increased personal safety concerns. O'Brien-Cousins (2000) and Prohaska et al. (2006) proposed for older people, the general reticence to commence physical activity was due to a perceived, as opposed to an actual awareness in risk. They are also aware they could harm themselves by falling over, or off their bikes, or they could be physically harmed. This aligns with the general theme of a widespread feeling of vulnerability amongst the older age group, resulting in their citing of lack of safety as a major barrier to physical activity (Schutzer & Graves, 2004). Subsequently, the following section investigates some of the barriers and motivators associated with physical activity.

2.5 Barriers and Motivators

To date, the key to physical activity motivation has mostly eluded researchers. Brown (2005) identified many reasons for being active, yet many individuals continue to be sedentary. The barriers and motivators that underlie the decision to be active or sedentary are therefore worthy of investigation. For ease of explanation, the categories that researchers have catergorised barriers and motivators into have been utilised in this section.

2.5.1 Barriers

Barriers effectively discourage physical activity, but tend to influence each person differently. In New Zealand, those involved in the provision and analysis of physical activity, have catergorised barriers into three groups (Sullivan, Oakden, Young, Butcher, & Lawson, 2003). These researchers have noted the influence of age, gender, circumstance and society on participation levels. The Exercise Benefits/Barriers Scale (EBBS) is a standardised measure for perceived benefits and barriers (Brown, 2005) and is often utilized when considering physical activity. Age is known to exacerbate some barriers Brawley, Rejeski, and King (2003) as they noted those aged 55 to 69 reported more symptom and motivational barriers, whereas those older than 69 years of age reported more environmental barriers. Not everyone does identify barriers, but health status appears to have an affect on how barriers are perceived. The majority of those who were ill or disabled were able to identify at least one barrier that affected their decision on physical activity participation (Schutzer & Graves, 2004). According to Brawley et al. women reported more barriers, but by tailoring their activity, they were more likely to

overcome many of these barriers. Lack of time was also consistently cited as a barrier, and other barriers included; weight, activity was uncomfortable and lack of energy and money. The key to increasing physical activity, according to Jones (2003), is to remove the barriers by understanding their effect and therefore reducing their importance. Although many of these barriers may only be perceived they do discourage activity, and are still cited as real or actual barriers.

Societal and peer pressure can also act as a barrier, as society tends to hold the viewpoint that physical activity for those nearing retirement is not socially acceptable. A new term in vogue, "ageism" has been described as social discrimination based on chronological or assumed age (Weiss, 2004). These feelings of ageism can affect how individuals think about activity, often leading to a reduction, or non-commencement. Hence adults often stated they were "too old" or it was not "expected behaviour". O'Brien-Cousins (2005) investigated further and added there was an embedded cultural norm that treated the elderly as frail, therefore possibly becoming a self fulfilling prophecy. To counteract the effect of barriers, there is a need to consider motivators, with the view to making motivators more important to the individual than barriers, particularly for those nearing their latter years.

2.5.2 Motivators

Motivators encourage people to be physically active, and similarly to barriers, vary with age, gender and circumstance. In New Zealand researchers have grouped them into

extrinsic or intrinsic (Sullivan et al., 2003) and advise of their importance when motivating individuals.

Some examples of extrinsic motivators can be social approval, being a positive role model or achievement certificates or trophies. Amongst the intrinsic motivators can be the social enjoyment and well being, weight loss and feeling fit. Motivation appears to differ for men and women as women tended to be motivated by compliance to instructions (Sherwood & Jeffery, 2000) and social interaction (Giles-Corti & Donovan, 2002). In contrast, for men, Sherwood and Jeffery suggested one important motivator was improved body image. However, many individuals have found activity maintenance difficult, as research established nearly half those who commenced a physical activity programme, stopped in the first six months (Friedrich, Gittler, Halberstadt, Cermak & Heiller, 1998). Ultimately according to Jones (2003), taking that first step was the most difficult, no matter what programs or policies were in place.

In summary, there are many barriers and motivators that affect physical activity. The decisional process involves weighing up the barriers and motivators, and when the motivator is stronger than the barrier, there is a greater chance of physical activity commencement. However, maintenance of a physical activity regime appears to be difficult.

2.6 Population of Interest

The age group most at risk of ill health due to declining levels of physical activity (Dishman, 1994) and increasing longevity (Statistics New Zealand, 2007) were those aged 55 to 70 years of age, a group that could now be considered the "new" middle age. During their lifetime, this group has been relatively unaware of the benefits of physical activity. Indeed, as children of the depression years, their parents would have been faced with survival on a daily basis, as opposed to any though to enhancing life. But recent international research suggests physical activity in later life, can actually be more beneficial than a whole lifetime of physical activity (W. Wolfsbauer, personal communication, May 22, 2008). Although men and women over 18 years of age were found to be more physically active in 2000/01 than 1997/98, the number of adults who wanted to be more physically active actually reduced from 35% to 29% during that period (van Alst et al., 2002). This new middle age cohort has undergone huge demographic changes in the past few decades. Their numbers have increased, and are still increasing, and three quarters can no longer be thought of as completely retired, as many are still actively contributing to society, either in the workforce or in a voluntary capacity. If this group were to become more active, the health benefits and the societal benefits would be enormous, as well as adding quality and quantity to their latter years.

Chapter Summary

This chapter clearly indicated physical activity levels across our nations were too low and although the benefits far outweighed the risks, physical activity levels have reduced with age. These benefits encompassed the physical, social and psychological domains, and

included reductions in mortality and morbidity as well as an identified protective effect for health. The risks were minimal and included fractures and safety concerns within the environment, but with careful management, these could easily be avoided. Both the barriers and motivators were complex and were shown to be age, gender and circumstance dependent. The last section identified the population of interest, which was men and women, aged 55 – 70 years of age. This group was identified as being "at risk" as they were becoming more sedentary than other age groups, yet unlike their forebears, could anticipate a longer life.

The next chapter considers four theoretical models that have investigated physical activity: social cognitive theory, the health belief model, the theory of planned behaviour and the transtheoretical model. Finally, the ecological model is discussed.

CHAPTER THREE: THEORETICAL MODELS

Introduction

This chapter initially discusses the methodology behind the use of theory, and then considers four theoretical models used extensively within the health psychology and physical activity domains. Each theory is critically considered, and then an insight is given into the reasons why the quest for a more suitable model commenced. Finally the decision to utilise the ecological model is explained.

3.1 Methodology

The many theories, frameworks and models deployed, differ markedly in their application. The bio-medical model, commonly referred to as the medical model, had historically been the preferred model, and indeed is still universally utilised, but primarily today within the medical system. However, many researchers became dissatisfied with this model, hence the move to models that were based on a social cognitive framework within the biopsychosocial paradigm. These models enabled researchers to examine behaviours in different contextual settings (Marks, Murray, Evans, & Willig, 2000), which is not possible with the bio-medical model. For health psychologists, this move toward a social cognitive model was a welcome move away from the rigid bio-medical model. However in more recent times, these social cognitive models, which work within an individual paradigm, have in many respects also become outmoded. Hence, Marks et al. and fellow researchers have noted the move to a more socially and environmentally oriented model, one that would enable researchers to make a broader investigation.

Therefore enabling studies to move away from research at the individual level, to research that operates within the social environment. When increased physical activity calls for a sustained change in behaviour (Sniehotta, Scholz, & Schwarzer, 2005), due to the many variables involved, the former "one size fits all" approach at the individual level is outdated.

As different theoretical models and methods apply to different people, the major key is to find which is the most effective for the particular behaviour. Bauman et al. (2002) conducted a meta-analysis, and identified the four most common theories used for physical activity research. These were social cognitive theory, the health belief model, the theory of planned behaviour and the transtheoretical model. However, of the variables considered to be important for physical activity, these four theories were still unable to incorporate 15 important variables, thereby lending support to the possibility of developing a more effective model. A critical examination of the four main theoretical models will ensue, then a discussion and justification for deploying the ecological model will follow.

3.1.1 Social Cognitive Theory

The central tenet of social cognitive theory (Bandura, 1986) is that motivation to learn a particular behavior will be learned by observations of actions that are rewarded or punished. This theory includes self-efficacy as a proximal determinant of motivation, and is used extensively throughout health domains. Examples of this model's deployment include designing health education, intervention strategies and behavioural

programs and explaining how people acquire and maintain certain behavioural patterns. However, there are many detractors of this cognitive model who cited low predictive ability (Lyons & Chamberlain, 2005) and that too much emphasis was being weighted toward self-efficacy at the individual level (Wilcox, Castro, & King, 2006). The latter further added generalisability across all age groups was low, and no account was taken of any external or environmental influences. Kahn et al. (2002) still support the use of this model though, as similarly to Bandura, they believe self-efficacy to be an important proximal determinant of human motivation. However, due to continuing societal changes, this theory may be too prescribed and inflexible to be effective within society today. Also, there are many external, historical and environmental influences that are unable to be considered with this theory.

3.1.2 Health Belief Model

The health belief model was originally developed by Rosenstock in 1966 (Rosenstock, 1974). The basis for this model (Marks et al., 2000; O'Brien-Cousins, 2000) asserts behavioural change only occurs after perceiving a health threat. Initially this threat was considered to be either, perceived susceptibility, severity, barriers or benefits, but more recently, efficacy and cues to action have been included (Jones, 2003). Therefore, there is a strong cognitive base, due to the "weighing" up of the situation. Proponents of this model such as Brown (2005) advised perceived barriers and benefits were often identified in research that investigated physical activity and that efficacy for this model was due to the simultaneous assessment of both the perceived barriers and benefits. One detractor though, suggested this model did not take external social influence into account (Jones,

2003). In reality, the ability to comply, no matter how seriously the advice is taken, can be open to many other influences, which do not always lead to compliance, and Marks et al. (2000) suggested this model had a limited ability to accurately predict health behaviour. Also, with health psychology's move toward a more preventive paradigm, the need to take external determinants into account has lead researchers to look for more effective models. However, historically, this model has been used extensively and successfully within the health psychology domain.

3.1.3 Theory of Planned Behaviour

The theory of reasoned action (TRA), developed by Ajzen and Fishbein (Ajzen & Fishbein, 1980) is based on the concept that the proximal determinant or cause of volitional behaviour is one's intention to engage in that behaviour. The theory of planned behaviour (TPB) is an extension of the theory of reasoned action and was developed in 1985 to address the original model's limitations in dealing with behaviours over which people have incomplete volitional control (Ajzen, 1991). The modification added subjective norms and perceived behavioural control, with the basic premise that converting intention into behaviour depends on individual control. Intentions, according to Ajzen, are assumed to capture the motivating factors that influence behaviour, and are indicators of just how hard individuals are prepared to exert effort in order to perform a behaviour. Rhodes et al. (1999) advised the theory involves appraising the attitudes and subjective norms of a particular behaviour, then evaluating the outcome, and then the decision on behavioural change is made. The more favourable the attitude and the subjective norm are, the greater the perceived control would be, leading to a greater

chance of behavioural change. The main criticisms for this theory were social environment was not taken into account and there was a heavy reliance on subjective norms (Rhodes et al., 1999). Also, Jones (2003) suggested this theory did not acknowledge past habits or behaviours, and Marks et al. (2000) noted only a small proportion of variance was able to be explained. This theory although well used, actually predicts intention, not actual behaviour, and as many factors can intervene, intention does not necessarily predict action.

3.1.4 Transtheoretical Model

Prochaska and Di Clemente initially developed the transtheoretical model, which is often referred to as the stages of change model (Prochaska & Di Clemente, 1982). This model includes five stages of change: pre-contemplation, contemplation, preparation, action and maintenance. The rationale behind this model postulates change occurs, after progression through the stages, and that choice is at the heart of any decision making procedure. Prochaska and Di Clemente initially used this model to reduce smoking levels, but this model is now more widely deployed (Godin, Lambert, Owen, Nolin, & Prud'homme, 2004), in particular with interventions to promote the adoption of positive behaviours (Fallon & Hausenblas, 2004). One advantage is the ability to evaluate determinants at any particular stage in the process (Rhodes et al., 1999), and as a result, popularity is growing (Sherwood & Jeffery, 2000) and has been recently used in New Zealand when investigating physical activity levels (Girling-Butcher, 2006; Kingi, Towers, Seebeck, & Flett, 2005; Towers, Flett, & Seebeck, 2005). However, the stages are rigidly placed and do not allow for external variables, and always assumes onwards progression through the

stages. Also, the intervention design must be prospective which is not always ethically or financially possible, given tight research funding.

3.1.5 Ecological Model

Due to the inability of the popular theories and models to comprehensively assess all the external influences of behaviour, many practitioners were not convinced they were utilising the best methods of inquiry. Philosophical changes in research methods and in society in general, have also impacted on the type of theories that are now required to understand the more complex situations. A theory that can operate at the community and environmental level would be more effective, and as Lyons and Chamberlain (2005) assert, would emphasise the social and environmental world, something that has previously been lacking. People interact in the world, hence the need for an approach that would acknowledge this interaction.

An initial proposal to develop an ecological theory came from Urie Bronfenbrenner (Bronfenbrenner, 1977) whilst he was working with children and analysing their development. This theory had the primary tenet that explained development in terms of the reciprocal influences between the individual and the settings that make up their environment. This ecological model, has become more popular in the last decade, has many supporters and enables researchers to conduct more complex research. Previous models and theories tended to be individualistic, less flexible and more prescribed, and according to Prohaska et al. (2006) were developed with younger populations and were adapted for use with the older populations. The newly developed ecological model states

health and behaviour are affected by the interaction of biological, behavioural, social, environmental and policy factors, and is able to examine the influences of these factors, singly, together or cumulatively (de Bourdeaudhuij & Sallis, 2002). In support, Prohaska et al. criticised the other models, which emphasised downstream behavioural approaches rather than upstream ecological approaches. Other advocates are King, Bauman, and Abrams (2002) who favour the transdisciplinary nature and Satariano and McAuley (2003) who endorse the integrative capacity. The ability to include both the complex social and physical environments and to consider the individual within the community has also bought favour. Phongsavana, McLean, and Bauman (2006) and de Bourdeaudhuij and Sallis (2002) noted the ability to identify the differing contributions of the psychosocial determinants. Furthermore Prohaska et al., advise this model is able to examine the mediating and moderating roles of different variables, at different levels across all age groups. Social cognitive methods only examine mediators or moderators that are cognitive in nature. Not surprisingly, many health promotion initiatives favour the ecological model (Berrigan & Troiano, 2002), as practitioners now require a more holistic and flexible approach, one that does not assume the same variables relate to different behaviours, or apply to the same populations.

Notwithstanding the above developments and move toward this new model, general research using the earlier theories and models is still warranted (Anderson, Wojcik, Winett, & Williams, 2006; Dishman et al., 2005; Sallis & Owen, 1999; Sherwood & Jeffery, 2000; Yael et al., 2005). However, a move toward the ecological model would lead to a fuller, more meaningful explanation of relationships. Of significance to New

Zealand are the parallels with a Māori model of health, Te Whare Tapa (Durie, 1998). The four central domains of this model are tinana (body - biological), hinengaro (mind - psychological), whānau (family - social/environmental) and wairua (spiritual). Given the relevance that this study has for New Zealand, apart from wairua, these two models are similarly aligned.

For the present study, a move toward utilising an ecologically guided model was considered more effective, in particular due to the broader determinants that can be included. There is also the capability to investigate the more complex interrelationships between the social, behavioural and environmental and policy factors and not just focus on cognition at the individual level (Bauman et al., 2002; Prohaska et al., 2006). Finally, according to Bauman et al., there is the aptitude to investigate possible mediating or moderating variables that are social, behavioural and environmental in nature, not just those that are individual or cognitive.

Chapter Summary

This chapter discussed and critiqued the methodology behind the four theoretical models that had been most popular in previous research. Those considered were social cognitive theory, the health belief model, the theory of planned behaviour and the transtheoretical model. Increasing critique of these models, predominantly due to the focus on cognition at the individual level and their non consideration of the contextual environment, has lead researchers to consider an ecologically based model that does consider determinants in a broader context.

The next chapter discusses the social support, health, gender and physical activity determinants that fit neatly within the ecological model.

CHAPTER FOUR: PHYSICAL ACTIVITY DETERMINANTS

Introduction

This chapter recognises health, social support and gender as three important determinants strongly associated with physical activity. Firstly, relationships between physical activity, social support and health are investigated, and then the possibility of mediating relationships is discussed. The effects of gender, then the possibility for a moderating relationship are considered, and finally the control variables discussed. This study is the first in New Zealand to consider these particular variables, whilst utilising an ecologically guided model. There has been some research in the physical activity arena in New Zealand (Girling-Butcher, 2006; Kingi, Towers, Seebeck, & Flett, 2005; Towers et al., 2005), but to date these studies have all used the transtheoretical model and small groups.

4.1 Bivariate Relationships between Social Support, Health and Physical Activity

4.1.1 Social Support and Physical Activity

Social support is one of the most important determinants of physical activity (Weiss, 2004), as identification with others as a member of a common social group, can provide a strong influence on participation. Figure 1 portrays the proposed relationship between social support and physical activity.

Figure 1. The social support and physical activity relationship.

High social support and high physical activity

A gregarious nature leads to socialising, and sport is generally an enjoyable experience due to the socialisation involved. A strong and enduring positive relationship with social support and physical activity, for those either middle age or post middle age has been well documented (Anderson et al., 2006; Phongsavana et al., 2006; Prohaska et al., 2006; Sherwood & Jeffery, 2000). As exercising with just one other leads to higher levels of physical activity, Sherwood and Jeffery (2000) consequently postulated the initial emphasis of any intervention should be on group activities. People continue to seek socialisation as they age, and as high social support is predictive of high levels of physical activity, the provision of social support is important to maintain physical activity participation.

High physical activity and high social support

McAuley et al. (2003) conducted a study with men to determine whether high levels of physical activity lead to high levels of social support. The results supported this hypothesis as frequency of physical activity was related to higher levels of social support. The more physical activity an individual was involved in, the more social interaction, therefore leading to increased levels of available social support. Trost et al. (1999) concurred, as their study with Australians aged over 60 years of age, also found a positive

relationship between physical activity and social support. Many people consider events with casual team sports, such as indoor soccer or netball to be a social as opposed to a sporting event. Often too this can lead to other activity based pursuits, which are encouraged by the sense of camaraderie.

Low social support and low physical activity

O'Brien-Cousins (1992) devised a study to investigate the relationship between social support and physical activity for women of retirement age. The results were unequivocal, as the participants with low social support had low levels of physical activity. The participants cited lack of social support as one of the two strongest barriers to physical activity, and that lack of friends willing to accompany or support activity lead to a reduction in activity. Therefore, those with low levels of social support should be encouraged into group activities, whilst taking the reduction in support networks that occurs with age (Rhodes et al., 1999), into account.

Low physical activity and low social support

When investigating the social support and health relationship, Pelletier et al. (2005) recognised the relationship between low physical activity and social support for those aged over 18 years of age. Those with low levels of physical activity had low levels of social support, due to those who were inactive having less opportunity to socialise. Often, physical activity is considered a social event, so those who are not active and do not join in with physical activities tend to miss many of these opportunities.

4.1.2 Social Support and Health

As far back as 1897, Durkheim postulated the breakdown in family structure would result in more ill-health (Weiss, 2004). The underlying reason for this relationship is quite complex, and according to Cohen, Underwood, and Gottlieb (2000), has never been fully quantified. However, support for the strong relationship between social support and health is well documented, and Figure 2 portrays this relationship.

Figure 2. The social support and health relationship.

High social support and high health

Those who are social, tend to be in good health. A research group lead by Weiss (2004) endorsed this relationship as they found high levels of social support lead to better health outcomes. Definite associations were also identified between social relationships and recovery from ill health (Anderson et al., 2006; Hale, Hannum, & Espelage, 2005; Spiegel, Bloom, & Yalom, 1989). Also, the findings by Hale et al. also suggested social support was able to protect or help maintain good health. This relationship however is complex, as high levels of social support were found to reduce stress and therefore improve health (Lyons & Chamberlain, 2006). A protective effect on health was also found (Adams, Bowden, Humphrey, & McAdams, 2000) therefore providing further support for the positive affect that social support has on health.

High health and high social support

Those with good health are naturally more able to socialise than those with poor health. Hale et al. (2005) found a positive relationship between good health and high social when they studied a group of rural women. These researchers identified those with a life style that promoted good health, tended to have higher levels of social support. Also, social support was found to be a strong predictor of whether or not the person engaged in health promotion (which includes physical activity) at all. Good health enables a person to be in the social domain and workforce more, therefore being more receptive to social support rather than having to actually seek out support.

Low social support and low health

O'Brien-Cousins (1992) investigated the relationship between social support and health for older women, and their results suggest lack of social support could actually be detrimental to health. A seminal study in Alameda County, California by Berkman and Syme included a large convenience sample of nearly 7,000 aged 60 to 94 years (Kaplan, Seeman, Cohen, Knudsen, & Guralnik, 1987). They have also found that low social integration lead to poorer health and consequently higher mortality. An indirect relationship was also identified when social isolation was viewed as a stressor (Cohen et al., 2000) as their research discovered the resulting negative psychological state increased the neuroendocrine response that adversely affected health. Compounding the situation is the knowledge that those with low social support tend not to actively seek medical help or support.

Low health and low social support

Berkman (1985) suggested researchers have only considered the possibility of an epidemiological link since the 1970s, and although no definitive reason has been found, Plante and Rodin (1990) postulate the reasons may be both psychological and biological. People who are not well do not and often can not socialise as much as those who are healthy, and in many cases, visitors eschew spending time with those who are ill, particularly the chronically or terminally ill. Compounding this situation is the knowledge people do not always feel comfortable in the presence of those who are unwell, therefore compounding the relationship between low health and low social support. A recent study involving social support, physical activity and brain injury identified a decrease in the size of the social network post injury (Driver, 2005), as there is support for the notion that sick individuals do not always want support as they do not want others to see them ill. Also, for some ill people, no matter how strong their support network, they are just not physically able to leave the house to socialise.

4.1.3 Health and Physical Activity

The reciprocal relationship between health status and physical activity is supported in literature (Kahn et al., 2002; Pretty et al. 2003). The latter research team further suggested physical activity was actually one of the primary determinants of health status. The reasons behind this relationship portrayed in Figure 3, is complex, as the benefits occur in differing amounts, regardless of age, environment, the level or types of activity or of any preexisting conditions (Peel et al., 2005).

Figure 3. The health and physical activity relationship.

High health and high physical activity

Empirical research supports the view, that healthy people are more able to be active. One study found that cardio respiratory endurance and psychomotor speed were the most significant predictors of adherence to physical activity for men and women aged 60 to 85 years of age (Emery, Hauck, & Blumenthal, 1992). Gilmour and Snell (2006) noted too, that not only were those in better health more physically active, they were able to be physically active with less chance of adverse health outcomes.

High physical activity and high health

Many individuals continue activity to improve or maintain their health, without really knowing why and how, yet studies have concluded physical activity improved health in many ways (Dishman et al., 2005; Giles-Corti & Donovan, 2002; Gilmour & Snell, 2006; Rejeski & Mihalko, 2001; Vuillemin et al., 2005; Weiss, 2004). In general, as well as the specifically targeted health improvements, such as weight loss or improved mobility, there was an overall feeling of wellness, better sleep and increased energy. Even occasional but regular physical activity, was able to reduce mortality levels by up to 40% (Sundquist et al., 2004). Psychological improvement was also found in one study with those in their middle age (Pelletier, Nguyen, Bradley, Johnsen, & McKay et al., 2005).

Also, Hillsdon, Brunner, Guralnik, and Marmot (2005) identified physical activity improved health by reducing the chance of functional disability.

Low health and low physical activity

The relationship between health and physical activity was investigated (Wolinsky, Stump, & Clark, 1995) with a group of women over 65 years of age. Physical health was identified as an important predictor of continued participation in physical activity, as those with poor health had lower levels of physical activity. Although functional disability can and does restrict a person from commencing a physical activity regime, Lee and Park (2006) found for some, a lack of confidence may be the reason for low physical activity participation.

Low physical activity and low health

As physical activity is good for health, sedentariness has been shown to lead to poor health. These two variables are inextricably linked, and the definitive reason for this has to date, eluded researchers. When a person was depressed, research showed low levels of physical activity lead to even lower levels of health (Singh et al., 2001), and those who were sedentary were actually more clinically depressed. Lawlor, Keen, and Neal (1999) stated many people have died unnecessarily or have not had a good quality of life due to not being active. Pretty et al. (2003) confirmed this relationship by establishing the sedentary were two times more likely to die prematurely than active people.

In summary, support for these three relationships has been illustrated by many empirical studies and interventions. However, the explanations for these relationships remain complex and inadequately tested.

4.2 Mediating Relationships

The enduring relationships between health, social support and physical activity, clearly indicate the possibility of an inter-relationship between all three variables. This proposal fits neatly with previous research (Satariano & McAuley, 2003), which suggested the social environment was linked to behaviour, and that individuals do exist and operate within a social environment. The ecological model can investigate the possibility of these interrelationships, as there is a possibility that there could be a third variable involved, due to the reciprocal nature of all three relationships investigated. Baron and Kenny (1986) have investigated the functions of a third variable, and recognise relationships can be more dynamic than just a correlational or causal relationship. Conceptually, a mediator variable is one that explains how or why another variable affects the outcome. A mediator is supposed to be influenced by the other variable directly. Endorsement for a possible mediating relationship is also apparent, as after much research and meta-analyses, Weiss (2004) concluded social support and health were often linked to physical activity. Psychologists, including McAuley et al. (2003) also noted the value of a mediating variable, and conducted much research in this area. As a result, this research team advocated the possibility of a mediating variable that predicted physical activity, through an already established relationship. Bauman et al. (2002) further noted that some cognitive-behavioural researchers have long advocated for mediator research because physical activity interventions actually operated primarily through a psychosocial mediating process. Two possible mediating relationships are now considered and examined.

4.2.1 Social Support Mediates Health and Physical Activity

One example of a mediating relationship would occur when health status influenced the level of social support, which in turn influenced the resulting level of physical activity. The relationships between health and physical activity would then be compared to the health and physical activity relationship after social support was included. Therefore, if a mediating relationship was present, it would be through social support, that health would affect physical activity (see Figure 4).

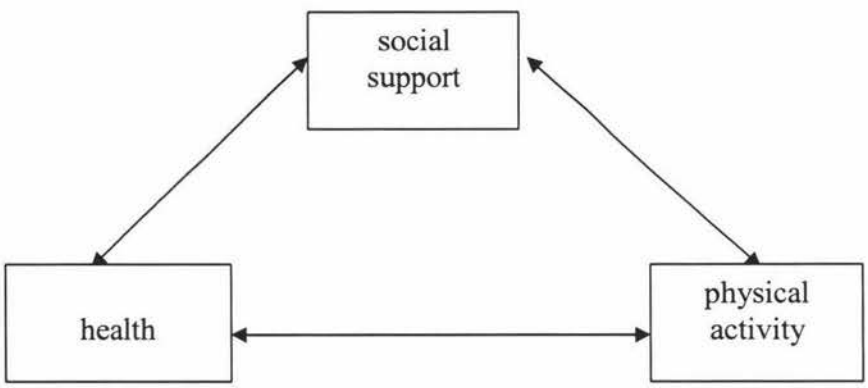

Figure 4. Social support mediates the health and physical activity relationship.

4.2.2 Health Mediates Social Support and Physical Activity

Another example of a mediating relationship would be when social support status influenced the level of health, which would in turn influenced the resulting level of physical activity. The relationship between social support and physical activity, portrayed in Figure 5, would then be compared to the relationship with social support and

physical activity after social support was included. Therefore, it would be through health, that social support would affect physical activity.

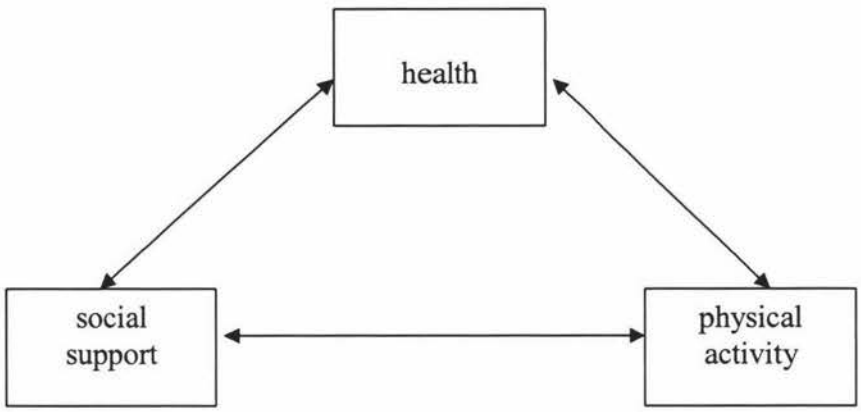

Figure5. Health mediates the social support and physical activity relationship.

4.3 Gender

The literature review identified gender was related to social support, health and physical activity in many differing ways, and that these disparities were widely known. The next section discusses the relationship that gender has with these variables, with a view to considering gender as a possible moderator of the social support and physical activity relationship.

4.3.1 Gender and Social Support

Men and women view social support differently (Hale et al., 2005). Social support appears to be more important for women than men, as empirical research noted females

were more likely to value and actively seek support and social involvement (Brawley et al., 2003; de Bourdeaudhuij & Sallis, 2002). Burton et al. (1999) also noted social companionship and affiliation was of paramount importance to women. Specific types of social support are viewed differently though, as women indicate family support is more important to them than friend support (Petosa, Suminski, & Hortz, 2003). Petosa et al. also suggested women tend to have more intimate social relationships and women claimed close friendships were more important to them than many social affiliations. For men, general social support did not appear to be so important, as they preferred more solitary pursuits, and were involved in group activities if circumstance necessitated (Hale et al., 2005).

4.3.2 Gender and Health

The disparities between health and gender are well known. Women are not as healthy as men, as they report illness more often, yet they live longer (Hale et al., 2005; Jones, 2003; USDHSS, 2002). This higher morbidity rate for women could be due to a higher ill health incidence associated with predetermined sex related health. Amongst these is child bearing, which generally necessitates more frequent visits to health professionals, and cervical cancer, a higher prevalence of arthritis and osteoporosis (Ettinger, Burns, & Messier, 1997). Women also have a higher incidence of occupational overuse syndrome. However, there are some ailments that occur more frequently for men, amongst which are cardio-vascular complaints (Moy, 2005), alzheimers disease (Fabrigoule, 2002) and certain cancers such as colon cancer (Gilmour & Snell, 2006). Men also have more accidents, which is generally due to the nature of the activity rather than being

physiologically determined. Therefore, the reason for women having a higher incidence of ill health is not due to a greater susceptibility to ill health.

4.3.3 Gender and Physical Activity

Internationally, males were found to be more active than females, and physical activity for both genders declined with age (Anderson et al., 2006; Costanzo, Walker, Yates, McCabe, & Berg, 2006; O'Brien-Cousins, 2000; Pretty et al., 2003; Schutzer & Graves, 2004; Sherwood & Jeffery, 2000; USDHSS, 2002; Weiss, 2004). Similar gender differences were found in New Zealand (Phongsavana et al., 2006; van Alst et al., 2002), with males of all ages being more active than females. The 2004 New Zealand Health Survey has documented this disparity, as 57% of men were involved in some type of vigorous activity during the week, compared to 49% of women (Ministry of Health, 2004). There may be a genetic difference for these disparities or inbuilt determinants that are shaped by circumstance and the environment, and the reasons for being physically active also differ. For example, Sherwood and Jeffery (2000) suggested men exercised more so they could look physically better. This may be the reason why men pursue resistance exercise and vigorous sports, as this builds muscle, whilst women tended to pursue the less vigorous pastimes such as aerobics and walking (van Alst et al., 2002). Burton et al. (1999) postulated males actually enjoyed physical activity more than females due to an innate competitive nature, and the ensuing adrenaline rush. The answer though may lie with less direct and more inbuilt influences, as O'Brien-Cousins (2000) noted gender disparity with physical activity could be due to evolutionary conditioning.

4.4 The Moderating Relationship

The documented gender disparities with social support (Petosa et al., 2003; Hale et al. 2005) and physical activity (van Alst et al., 2002) indicate the possibility of a moderating relationship (see Figure 6). Conceptually, a moderator specifies on whom or under what conditions another variable will operate to produce the outcome. A moderator is supposed to affect the relationship between the other variable and the outcome. Therefore a closer examination of the relationship will be conducted, as the existence of a moderating relationship would lead to an increase in understanding of the relationship between social support and physical activity. As women have higher social support levels yet in general lower levels of physical activity, the inclusion of gender as the moderating variable, therefore suggests the relationship between the social support and physical activity could be partially determined by gender.

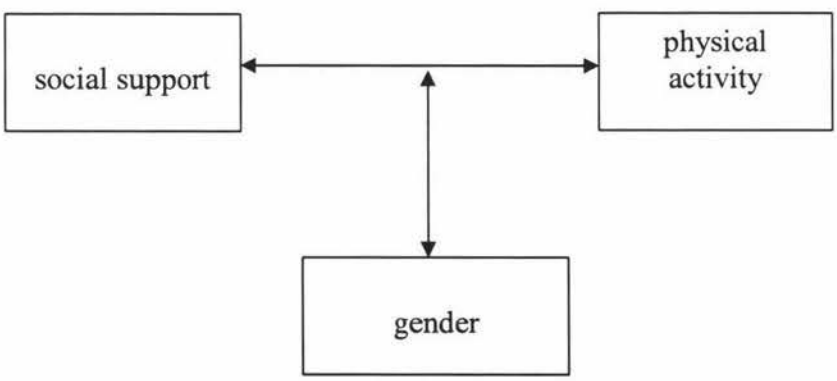

Figure 6. Gender moderates the social support and physical activity relationship.

4.5 Control Determinants

Although health, social support and gender are important determinants, other variables can affect their relationship. These include, amongst many other possibilities, socioeconomic status, retirement status, age and ethnicity. The decision to control for the effect of these determinants was made after various international research projects noted each had enduring relationships with social support, health and physical activity (Anderson et al., 2006; Duncan, 2005; Rhodes et al., 1999; van Alst et al., 2002). To enable the probable effects to be quantified and discussed, their importance to physical activity is now considered.

4.5.1 Socioeconomic Status

Epidemiological research conducted overseas, consistently identified the enduring relationship between socioeconomic status and physical activity (Anderson et al., 2006; Burton et al., 1999; Rhodes et al., 1999). In New Zealand, there is also a positive relationship between socioeconomic status and physical activity (van Alst et al., 2002). These findings however, are tempered with the knowledge that those with a higher socioeconomic status usually have higher educational qualifications, better health and therefore would be assumed more knowledgeable about healthy lifestyles. One inverse relationship between socioeconomic status and physical activity was noted in New Zealand though, particularly post retirement (Brawley et al., 2003). Although, retirement potentially allows more time to be active, lower finances tend to lead to less choice in the type of physical activity, and therefore reduced levels of participation.

4.5.2 Retirement Status

The general assumption could be that more leisure time in retirement leads to more time to be physically active. In one study with those aged 40 to 65 years in the Netherlands, the levels of physical activity reduced greatly after retirement (Slingerland et al., 2007), and a similar situation has been identified in New Zealand for both men and women (van Alst et al., 2002). The traditional retirement age of sixty years no longer exists, hence people are working for longer and their retirement status cannot be assumed from age. Schutzer and Graves (2004) and Sherwood and Jeffrey (2000) identified a perceived lack of time was a significant barrier to physical activity participation. Conversely, when time was available, some felt unproductive and therefore did nothing (Conn, Tripp-Reimer, & Maas, 2003). Change nevertheless is on the way. Subsidized gym membership and paid time off work to pursue physical activity has been introduced into some areas of the employment sector. These enlightened employers are aware that physically active staff are healthy staff, boding well for a happy employer – employee relationship. These initiatives can reduce sick leave by up to 32%, reduce health costs by up to 55% and increase productivity by up to 52% (USDHSS, 2002).

4.5.3 Age

There is an inverse relationship between age and physical activity. Aging is associated with a functional decline in health, therefore leading to lower levels of physical activity (Dishman, 1994; Prohaska et al., 2006). Also as a person ages the activities sought are less physical, less conspicuous and more convenient, such as gardening and walking (Pratt et al., 2004). Though some people, women in particular believed physical activity

was not appropriate and actually felt uncomfortable (Brawley et al., 2003). However, moves to stem this age related decline have long since commenced. Activities such as the Masters Games have publicly reduced many barriers by making physical activity for those aged over 40, socially acceptable.

4.5.4 Ethnicity

Most western nations could now be considered multicultural, yet cultural restraints for some does not easily allow participation in physical activity. In early 2007, New Zealand debated the topic of culturally acceptable swimming attire for Muslim women. Some pools opening for "women only" swimming alleviated the situation. Brawley et al. (2003) advised cultural differences presented unique challenges when designing interventions. One Australian study successfully used the ecological model to identify culturally specific interventions. The main determinant was physical activity, and although some factors were specific to a particular ethnicity (Belza et al., 2004) the providers were still able to develop culturally specific interventions. In New Zealand, similar levels of physical activity were apparent for Māori, Pacific Island peoples and Europeans (van Alst et al., 2002). This may be due to all ethnicities being exposed to many sporting opportunities through initiatives such as Active Schools and the Push Play programme.

Chapter Summary

International research has identified three central determinants of physical activity, namely social support, health and gender. Support for these relationships was

documented by many researchers, hence the decision to consider the strength of correlations between physical activity, social support and health. Also, two mediating relationships, between health, social support and physical activity were proposed. Due to the noted gender differences, the decision was also made to consider gender as the moderator in the social support and physical activity relationship. Finally four control determinants; socio-economic status, retirement status, age and ethnicity were discussed. Chapter five describes and discusses the rationale for the present study.

CHAPTER FIVE: THE PRESENT STUDY AND HYPOTHESES

Introduction

This chapter discusses the rationale for the present study, based on information derived from current literature. The six main hypotheses will then be stated.

5.1 Study Overview

Worldwide research informs our nations that we are not active enough to maintain good health, yet physical activity levels are declining and our population is aging. From 2001 to 2026, the people aged 65 years and over will increase from 12% to 19% of the entire population (Wang et al., 2006). This situation is compounded by increased pressure on health resources due to chronic diseases, such as heart disease, stroke, cancer, chronic respiratory diseases and diabetes. Ageing also tends to be associated with a natural decline in functional capacity.

To date, New Zealand's research into physical activity participation has not been as prolific as overseas, and no studies have investigated links with psychosocial or environmental variables. A small number of research projects involving physical activity have been undertaken, but these have primarily involved school age children or small and often symptomatic groups. The international studies discussed in literature have used differing theories and methods, with many being based on comparisons using control groups. This can potentially be problematic, due to population differences. The methods

employed were generally conducted with an individualistic approach, with success often measured by change in level of a specified disability (Brawley et al., 2003; Hillsdon et al., 2005; Pelletier et al., 2005), as opposed to any general health improvement. Whilst international results give an indication of what can be expected in New Zealand, the results are not fully generalisable. Prior to the HWR Study, the only research using large groups within New Zealand has been conducted by SPARC, and the continuing longitudinal Dunedin cohort study (Poulton et al., 2006).

Despite the reducing levels of physical activity, only in the last two decades has inactivity become recognised as a population-wide phenomenon, requiring preventative interventions. Although attention was drawn to the possible consequences more than one hundred years ago, research has still not found the key to increasing physical activity participation. Clearly, knowledge of the benefits has not been enough to encourage people to be active. Therefore, as there is poor understanding of the various reasons for inactivity in New Zealand, those who work within this area may be ill equipped to develop appropriate interventions.

In New Zealand, though activity levels were higher than those internationally, the need for public awareness of the benefits of physical activity is important. There is mounting international evidence to support and endorse the claim that our populations need to be more active. The potential benefits identified were biological, social and psychological, and they all far outweigh any possible risks. Due to the dearth of research in New Zealand, the true central determinants for physical activity are not known. Therefore, the

decision was made to consider those determinants consistently associated with international physical activity research and to be guided by the ecological model. With little confirmation of the key behaviours that contribute to inactivity, the difficulty is to ascertain where and when to intervene and to be confident that action will avert the burgeoning health issues. But these variables do not operate in a vacuum, hence the need to investigate other peripheral variables with known enduring and strong relationships with activity. The chosen control variables are socioeconomic status, retirement status (retired or not retired), age, gender and ethnicity (Māori or non Māori).

The population of interest chosen was 55 to 70 years of age, the "new" middle age. Historically, this age group was deemed to be old, but today, due to huge societal and employment changes, this group is still very active in society and the workforce. Due to the increased longevity of our population, some of this group could possibly live until they are 90 years of age, hence the need to maintain good health. Even a small amount or small increase in physical activity participation can support improved health or at the very least maintain health (van Alst et al., 2002). As a result of any improvement in physical activity, this group will have better levels of health, compressed morbidity and extended mortality. Any investigation to identify the determinants central to attaining or maintaining a sufficient level of physical activity for this age group will be extremely beneficial.

5.2 Study Aims

This research is guided by the ecological model and will investigate the central determinants that influence levels of physical activity. Such knowledge could therefore, be used to guide the future development of educational programmes and interventions that could target physical activity levels. However, a truly ecological approach will not be included, as no account of the physical environment is included in the analyses.

5.3 Hypotheses

The following hypotheses emanate from the research question "Are social support, physical health, mental health and gender important determinants of physical activity for New Zealanders aged 55 to 70 years of age?"

5.3.1 Hypothesis 1

Social support will have a positive relationship with physical activity.

5.3.2 Hypothesis 2

Social support will have a positive relationship with health.

5.3.3 Hypothesis 3

Physical activity will have a positive relationship with health.

5.3.4 Hypothesis 4

Social support will mediate the health and physical activity relationship.

5.3.5 Hypothesis 5

Health will mediate the social support and physical activity relationship.

5.3.6 Hypothesis 6

Gender will moderate the social support and physical activity relationship.

Chapter summary

This chapter discussed the findings of the literature review that confirmed New Zealanders are not active enough and that those aged 55 to 70 years of age are most at risk, due to the burgeoning health issues they could face. Support was then endorsed for the inclusion of social support, health and gender as central determinants of physical activity participation. The hypotheses were then stated.

Chapter six describes the participants and the procedures involved in the study.

CHAPTER SIX: METHODS

Introduction

This chapter discusses the study design, the demographics of the participants, and then each of the measures is described. Finally, the actual procedures and statistical analyses undertaken are discussed as well as specific information about the HWR Study, a national longitudinal research project.

6.1 Study Design

A cross-sectional study design was used to investigate the relationship between the central determinants and physical activity. A questionnaire was utilised for the collection of data relating to various aspects of the participants' lifestyles.

6.2 Participants

There were 13,045 participants who were randomly selected from the electoral roll and sent a questionnaire. Within this group 5,265 were from a general population sample and 7,780 of those who identified themselves as Māori. The latter group was selected using the Maori descent indicator on the combined electoral roll dataset. While Māori currently make up 7.8% of the general population aged 55 to 70 years, there were inherent problems in using only the Māori respondents from the electoral roll, through which to explore health, work and retirement factors (Towers, 2006). Due to the lower proportion of Māori respondents to the pilot questionnaire, the decision was made to over sample the Māori population. Therefore, ensuring a more representative sample that is able to mirror

the complexities of our general population. Of the questionnaires returned, 3,108 were from the general sample, and 3,554 from the Māori sample, response rates of 59% and 46% respectively. In total, 6,662 postal questionnaires were returned, reflecting an overall response rate of 53%. Descriptive statistics for this sample are provided in Table 2, in the results section.

6.3 Measures

For the present study, physical activity is the dependent variable, and the independent variables are social support and both physical and mental health. A further group of control variables; socio economic status, retirement status, age, gender and ethnicity will be considered so any extraneous effects may be removed from the analyses. Furthermore, the effects of gender will be considered as an important determinant when considering a moderating relationship. The questions and measures can be viewed in Appendix one (page 134).

6.3.1 Physical activity

Two questions relating to methods of assessing physical activity levels were used in the questionnaire. Both emanated from the IPAQ-SF, which has been normed for New Zealand use. The norming process was a joint project between SPARC and the Ministry of Health (McLean & Tobias, 2004; Moy, 2005). When validating the measure for New Zealand use, Moy did not find any significant differences in physical activity participation across the ages. Due to the demonstrated effectiveness, this tool has since been endorsed for use with large surveys (IPAQ Research Committee, 2005) has been

renamed the NZPAQ-SF and as reported by Moy, been adopted for use by Government bodies in New Zealand. The present study utilised one question from the NZPAQ-SF, which sought the number of days during which the participant was either vigorously active for 15 minutes or more or moderately active for 30 minutes or more in the previous week. The answer to this question sits neatly within SPARC's "Push Play" campaign that stipulates at least 30 minutes of physical activity for at least five days each and every week (SPARC, 2003). Individuals who meet SPARC's criteria for adequate physical activity are labeled "regularly physically active" (Wang et al., 2006).

6.3.2 Health

The SF-36v1, originally devised by Sherbourne and Ware (1988) as a measure of subjective physical and mental health was utilised for this study. Subsequently, version two was developed in 1996 (Ware, 2000). The eight sub-scales relate to physical health (physical functioning, role physical, bodily pain and general health) and mental health (vitality, social functioning, role emotional and mental health). The data is transformed into a 0 -100 scale, and is therefore continuous. Analytical support for this measurement tool was strong and came from many quarters. Kaholokula, Haynes, Grandinetti, and Chang (2006) noted the proven international generalisability as well as ease of use, with reliability and validity also being endorsed (Department of Health and Aging, 2006). Empirical analysis by Ware and Sherbourne (1992), confirmed linear relationships and external reliability, and one recent study with physical activity and health advised cronbach's alpha ranged from .74 to .87 (Vuillemin et al., 2005). Most studies considered had reliability that exceeded .70. Further endorsement is clear, as there are

approximately 100 translated versions worldwide (Ware, 2000). Further support for use with this study came from Van de Velde-Coke (2004), who acknowledged the benefits of using this tool for those in the middle age group, and Kang (2003) who acknowledged the efficacy of use for those in the older age groups.

In New Zealand, Scott, Sarfati, Tobias, and Haslett (2000) noted good reliability and a cronbach's alpha of .80, but cautioned the questions were not generally acceptable to Māori and Pacific Island peoples. For the present study however, cronbach's alpha was very acceptable, with .75 for physical health and .84 for mental health.

6.3.3 Social Support

The Social Provisions Scale, developed by Cutrona and Russell (Cutrona & Russell, 1987) was used to measure social support. This scale identifies six relational provisions of social support; social integration, reassurance of worth, reliable alliance, opportunity for nurturance, and guidance. For each of these sub scales, there were four questions, two positive, and two negative, and these were answered on a rating 1- 4, from strongly agree to strongly disagree. Although this scale was originally designed to understand the influence of social support on stress, Driver now advises this scale is one of the three most preferred for physical activity research. There was good statistical and empirical support for using this measure with cronbach's alpha ranging from .65 to .90 (Cutrona et al., 1986; Driver, 2005; McAuley, Elavsky, Jerome, Elavsky, Marquez et al, 2003; McAuley, Elavsky, Jerome, Konopack, & Marquez, 2005). The data for the present

study was transformed from 0 – 100 and the cronbach's alpha for the present study was found to be .89.

6.4 Control Variables

Empirical research identified many variables that had a strong relationship with physical activity. The following five will be used as controls so their effects can be statistically controlled.

6.4.1 Socioeconomic Status

The Economic Living Standard Index Form (ELSI sf) was utilised as an indicator of socioeconomic status. This self rated tool, with 25 items from four main questions, equates the material aspect of wellbeing with a person's consumption and the acquisition of personal possessions. Developed and endorsed by the Ministry of Social Development in New Zealand (Jensen, Spittal, Crichton, & Krishnan, 2002), this tool is particularly effective when analysing survey results. The rationale behind the Ministry's endorsement was the ability to separate the effects of income from living standards. For ease of use, the answers were calibrated to a numerical figure that equated to a descriptive standard of living, on an interval scale. Jensen et al. recorded cronbach's alpha of .88, which confirmed excellent internal consistency, as well as identifying good validity. Cronbachs' alpha for the present study was found to be .81.

6.4.2 Retirement Status

Individuals identified themselves as either completely, partly or not retired at all. This subjective measure of retirement status was originally used in the American Health and Retirement Study, a longitudinal Study of older adults (A Towers, personal communication, May 22, 2007). With the status of retirement ascertained, a general assumption could then be made on the amount of leisure time available. For statistical purposes, as shown in Table 3, the answers were collapsed to two variables, to show whether a person was either fully retired or not fully retired. The reason for collapsing the data to a dichotomous variable was so that this variable could be included in the regression analyses.

6.4.3 Age

The date, month and year of birth was obtained and this was subtracted from the year the questionnaire was administered. This method was endorsed by use in The New Zealand Census (Statistics New Zealand, 2002).

6.4.4 Gender

A single dichotomous item indicated gender.

6.4.5 Ethnicity

When calculating the single ethnicity variable which resulted in all participants being assigned to only ONE of the six basic ethnicity sets, the same rules as applied in the 2002/2003 New Zealand Health Survey (Towers, A. Personal communication, 26 June,

2008). Ethnicities were accorded priority ranking, and if multiple ethnicities were provided then the respondent was assigned to the ethnicity with the highest rank. The rules are provided below in rank order such that the first rule is applied, and subsequent rules apply to those participants who have not been assigned to a specific ethnic group on the basis of prior rules:

(1) If Māori was one of the groups reported by a respondent, then the respondent was assigned to 'Māori'

(2) If a Pacific ethnic group was one of the groups reported and Māori was not reported, the respondent was assigned to 'Pacific'

(3) If an Asian ethnic group was one of the groups reported and neither of the above were reported, the respondent was assigned to 'Asian'

(4) If an MELAA ethnic group was one of the groups reported and of the above were reported, the respondent was assigned to 'MELAA'

(5) If New Zealand European or Kiwi or New Zealander ethnic group was reported and none of the above were reported, the respondent was assigned to 'New Zealand European'

(6) If "other" was reported as the main ethnic group (which included non-respondents to the question) and no other ethnicities were reported, the respondent was assigned to "other".

6.5 Procedures

The HWR Study is a longitudinal study which is surveying a cohort of New Zealand men and women born between 1935 and 1951. This study was established to assess how the

transition from work to retirement impacts on older people's independence and well-being in their retirement years. The information collected is based on health, psychosocial factors, work, socioeconomic and demographic status over time, as older individuals make the transition from work to retirement. The overarching hypothesis is that psychosocial variables at midlife predict health after retirement. The proposed research is based on understandings that good health is integrally related (as antecedent, outcome, and component) to independent living and community participation.

The Dillman Tailored Design method which was developed in 2000 was utilised for the data collection (Towers, 2006). This involved sending out a prenotice, the questionnaire, a reminder postcard, a replacement questionnaire, and a final reminder postcard. Overall 13,045 people were sent the questionnaire on March 20th 2006. Reminder postcards were issued, with the final reminder post card, which was the fifth stage of posting being sent out on the 6th June 2006. From 29th September, no more responses were accepted. More in depth information pertaining to the participation selection process can be found on the HWR website, www.hwr.massey.ac.nz/resources/methodology_towers.pdf. The present study drew on the responses from participants in the first wave collection. Prior to the initial surveys being posted, ethical approval was sought from the Massey University Human Ethics Committee (HEC: PN 05/90).

6.6 Statistical Analysis

The statistical analyses were completed using SPSS for Windows 14. Any missing cases were excluded during analysis using pair wise deletion allowing data to be included in the

analyses for which they had the necessary information. This procedure ensured no marked decrease in the number of participants. Most of the missing data did not exceed 4%, except social support at 8.1 % and the socioeconomic question 10.4%. Although the latter response rate was low, the data was still included, primarily due to the documented relationship between income and physical activity. Also, response rates to the socioeconomic questions tend to be low.

The bivariate relationships were tested using Pearson's *r*, and the differences between groups were tested using *t*-tests. The four continuous main variables, physical activity, social support, physical health and mental health were investigated using the correlational analyses (see Table 4). The control variables were either continuous (socioeconomic status and age), or dichotomous (retirement status, gender and ethnicity). Due to the participant selection and the questionnaire distribution procedure, the assumption of independence was made. Although there were some outliers for the two health variables (as indicated by viewing the box plots), the difference between the mean and the 5% trimmed mean did not exceed 1%, which is acceptable for a large population group (Tabachnik & Fidell, 2001). Therefore, their presence made little difference to the overall mean. The internal reliability statistics and the coefficient alphas were reported in the measures section, and all had acceptable results. Normality of distribution was checked using normal probability plots and the calculation of skewness and kurtosis on the continuous variables was checked from the descriptive statistics data. The possibility of multicollinearity was also considered, but as no correlations exceeded .7, the maximum allowed (Tabachnik & Fidell, 2001), no combining of variables was necessary.

Both the tolerance and variance inflation factors were checked from the coefficients table, and all values ensured these assumptions were met. Lastly, linearity, homoscedasticity and independence of residuals were checked by viewing the scatter plots. These three assumptions were also met. Therefore, full consideration of the assumptions was made, resulting in the meeting of all the required assumptions, prior to the commencement of the statistical analyses. Means and standard deviations were computed for each of the continuous variables employed (see Table 2). Bivariate associations were analysed by using the Pearson's *r* correlation coefficient (see Table 4), and any gender differences were explored using independent t-tests. The Levene's Tests were used to test the assumption of equal variances across gender. These tests showed that only physical activity, with a significance level greater than .05 assumed equal variance. Accordingly, alternative *t*-values were used for the other three variables. *T*-tests assessed the significance of the effect of each independent variable in terms of standardized regression coefficients and betas. The procedure used to analyse any mediating and moderating effects with variable control was hierarchical multiple regression (Tables 5, 6, 7, and 8). The multiple correlation coefficient *R*, was used to test the goodness of fit of the linear model and the proportion of explained variance in the dependent variable by the independent variables and the Adj. R^2 was tested for statistical significance by an *F*-test. As this project is the first data collection of a study with an estimated longevity of ten years for the five waves, the HWR will have at least 90% power to detect a moderate effect, with $p < .05$ (Towers, 2006).

CHAPTER SEVEN: RESULTS

Introduction

This chapter discusses the data management process and then considers each of the determinants. The effect that gender has on the four main variables is then investigated, and finally, the hypothesis testing process is described, alongside the results.

7.1 Data Management

Prior to any analyses the results were screened for errors in data entry. For all analyses, the alpha was set at $p < .05$ although higher significance levels were reported. Internal reliability analysis was conducted and coefficient alphas reported in the methods section.

7.2 Descriptive Statistics

Table 1 shows the response rates and missing data for each of the variables.

Table 1

Response rates and missing data for variables.

Variable	Total Respondents		Missing Data	
	(N)	(%)	(N)	(%)
Physical Activity	6,136	95	277	5
Social Support	5,895	92	517	8
Health	5,947	93	466	7
SES	5,743	90	666	10
Retirement Status	6,181	97	232	3
Age	6,413	100	0	0
Gender	6,413	100	0	0
Ethnicity	6,373	99	40	1

The descriptive statistics in Table 2, display the means, standard deviations, range mode for both males and females.

Table 2

Descriptive statistics for continuous variables.

	Male (n = 3,070)				Female (n = 3,433)			
	Mean	S.D.	Range	Mode	Mean	S.D.	Range	Mode
Phys. activity	4.26	2.40	7.00	7.00	4.55	2.27	7.00	7.00
Social support	78.17	10.01	63.00	71.00	80.09	9.74	52.00	72.00
Phys. health	46.04	7.14	48.99	47.76	45.94	7.49	52.93	51.06
Mental health	50.04	9.92	75.23	55.22	49.55	10.42	75.18	59.92
SES	5.16	1.52	6.00	6.00	4.79	1.70	6.00	6.00
Age	60.78	4.61	15.00	59.00	60.61	4.50	15.00	55.00

7.2.1 Physical Activity

The reported number of active days a person was sufficiently active was ($M = 4.23$, $SD = 2.35$), and the response rate to this item was 95.7% (6,136). The results for males and females are reported in Table 2. There was a significant difference for physical activity as females were more active than males, ($M = 4.26$, $SD = 2.40$) and females ($M = 4.55$, $SD = 2.27$), $t(6010) = -5.385$, $p < .001$. The number of active days ranged from 10% (614) who stated they were not active on any days of the previous week, to 28.85% (1,765) who stated that they were active in seven days in the previous week. The

participants who were regularly physically active for five days or more, and therefore met the SPARC criteria, totalled 55.2% (3,380). Females reported more activity than males: 57% of females and 53% of males met the required standard, yet 9% of females and 11% of males were not active at all. These results are reported in Table 3.

7.2.2 Social Support

The reported level of social support was ($M = 79.02$, $SD = 9.94$), the response rate to this item was 91.9% (5,895), and the range for all participants was 33 to 96. The results for males and females are reported in Table 2. There was a significance difference for social support as females reported higher levels of social support, males ($M = 78.17$, $SD = 10.01$) and females ($M = 80.09$, $SD = 9.74$), $t(5893) = -6.637$, $p < .001$.

7.2.3 Physical Health

The reported level of physical health was ($M = 45.77$, $SD = 7.47$), the response rate to this item was 92.7% (5,947) and the range for all participants was 13.83 to 64.67. The results for males and females are reported in Table 2. There was no significant difference in health, males ($M = 46.04$, $SD = 7.14$) and females ($M = 45.94$, $SD = 7.49$) t (5943) = .855, $p = .392$.

7.2.4 Mental Health

The reported level of mental health was ($M = 49.80$, $SD = 10.18$), the response rate to this item was 92.7% (5,947) and the range for all participants was -6.94 to 69.11. The results

for males and females are reported in Table 2. There was no significant difference in health, males ($M = 50.22$, $SD = 9.78$) and females ($M = 49.93$, $SD = 10.21$) $t(5939) = 1.871$, $p = .061$.

7.2.5 Socioeconomic Status

The reported level of socioeconomic status was ($M = 5.20$, $SD = 1.51$), the response rate to this item was 90% (5,743). The results (see Table 2) show that males had higher levels of socioeconomic status than females ($M = 5.16$, $SD = 1.52$) and ($M = 4.79$, $SD = 1.7$) respectively.

7.2.6 Retirement Status

The retirement status was 76% (4,698) not retired and 24% (1,483) were fully retired, and the response rate to this item was 96.4% (6,181). The results for males and females are reported in Table 3. More females than males were fully retired 29% (918) and 21% (565) respectively.

Table 3
Demographic information on participants (n = 6413).

	Male		Female	
	(N)	(%)	(N)	(%)
Gender	3,070	48	3,343	52
Social Support				
Low	1,118	39	922	30
Medium	956	33	1,100	36
High	781	27	1,019	33
Physical Health				
Low	922	32	1,064	34
Medium	1,020	36	964	31
High	916	32	1,062	34
Mental Health				
Low	926	32	1,056	34
Medium	1,002	35	980	32
High	930	32	1053	34
Age				
55-59 years	1,374	45	1451	43
60-64 years	856	28	1,021	31
65-70 years	841	27	869	26
Ethnicity				
European	2,071	68	2,375	72
Māori	218	8	275	8
Others	761	25	670	20
Standard of Living				
Hardship	151	11	275	17
Comfortable	446	31	566	35
Good standard	2,156	58	2,149	48
SPARC Physical Activity Guidelines				
0 days	338	11	276	9
1-4 days	1,149	36	1,093	34
5-7 days	1,556	53	1,823	57
Retirement Status				
Not fully retired	2,437	81	2,261	71
Fully retired	565	19	918	29

7.2.7 Age

Three age bands were identified as follows; 36.1% (2,826) were aged from 55 to 59 years, 37.2% (1,876) were aged from 60 to 64 years, and 26.7% (1,711) were aged from 65 to 70 years of age. The average reported age was ($M = 60.95$, $SD = 4.58$) and the response rate to this item was 100% (6,413). The average age for females was ($M = 60.78$, $SD = 4.61$) and for males ($M = 60.01$, $SD = 4.50$), and the range was 55 to 70 years of age (see Table 2).

7.2.8 Gender

The gender question was answered by 100% (6,413) of the respondents. Of those, 48% (3,070) were males, and 52% (3,343) were females. The results are reported in Table 3.

7.2.9 Ethnicity

The response rate to this item was 99.4% (6,373). For statistical purposes, the possible nine options were collapsed into five groups, due to small numbers in some cells. The largest group was European 70% (4,446), Māori 8% (493) and Pacific Island peoples 3% (203). These results are reported in Table 3. For the multivariate statistical analyses, the variables were collapsed into a dichotomous variable of either Māori or non Māori. A dichotomous variable was required so ethnicity could be included in the regression equations.

7.3 Hypotheses Tests and Results

Bivariate correlations were conducted for hypotheses one, two and three. The variables were social support, physical health, mental health and physical activity. Table 4 displays the Pearson's *r* correlation coefficients for these variables as well as the control variables; socioeconomic status, retirement status, age, gender and ethnicity. Preliminary analyses had been performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity.

7.3.1 Hypothesis 1

It was hypothesised that there was a positive relationship between social support and physical activity. The results showed a positive relationship ($r = 0.11$, $n = 5{,}689$, $p < .01$). As $r^2 = .01$, there is 1% shared variance.

7.3.2 Hypothesis 2

Hypothesis 2a. It was hypothesised that there was a positive relationship between social support and physical health. The results showed a positive relationship ($r = 0.14$, $n = 5{,}553$, $p < .01$). As $r^2 = 0.01$, there is 1% shared variance.

Hypothesis 2b. It was hypothesised that there would be a positive relationship between social support and mental health. The results showed a positive relationship ($r = 0.34$, $n = 5{,}553$, $p < .01$). As $r^2 = 0.11$, there is 11% shared variance.

Table 4

Significant Pearson's r Correlation Coefficients for all Variables.

	1	2	3	4	5	6	7	8	9
1 Physical activity	-								
2 Physical health	.19**	-							
3 Mental health	.18**	.11**	-						
4 Social support	.11**	.14**	.34**	-					
5 SES	.07**	.26**	.37**	.29**	-				
6 Retired/Non-retired	-.02	.24**	.04**	.07**	.08**	-			
7 Age	.01	-.20**	.06**	-.06**	-.06	-.48**	-		
8 Gender	.07**	-.10	-.02	.09**	-.09**	-.12**	-.00	-	
9 Maori/Non-Maori	-.03*	-.09**	-.07**	-.03*	-.16**	.02	-.01	-.02	

* $p < .05$, ** $p < .01$

7.3.3 Hypothesis 3

Hypothesis 3a. It was hypothesised that there was a positive relationship between physical health and physical activity. The results showed a positive relationship ($r = 0.19$, $n = 5{,}710$, $p < .01$). As $r^2 = 0.03$, there is 3% shared variance.

Hypothesis 3b. It was hypothesised that there was a positive relationship between mental health and physical activity. The results showed a positive relationship ($r = 0.17$, $n = 5{,}710$, $p < .01$). As $r^2 = 0.02$, there is 2% shared variance.

7.3.4 Hypothesis 4.

Hierarchical multiple regressions to determine the proposed mediating relationships were calculated for hypotheses 4a, 4b, 5a and 5b. This method is preferable to an ANOVA, as median splits can be less precise (Frazier et al., 2004). The bivariate relationships between physical health and physical activity and mental health and physical activity ranged from $r = .17$ to $r = .19$ respectively, and were significant ($p < .01$). The bivariate relationships between mental health and social support and physical health and social support ranged from $r = .14$ to $r = .34$ and were all significant ($p < .01$). The bivariate relationship between social support and physical activity was $r = .11$ and was significant ($p < .01$). All the necessary criteria for mediation analyses were met (see Baron & Kenny, 1986). Checks had been made to ensure no violations of the assumptions for outliers, normality, linearity, homoscedasticity and independence. Three equations tested the possibility of each mediating relationship. The variables were entered in a stepwise fashion, based on the research question, which was underpinned by research and theory.

The dependent variable was entered, then the control variables, then the independent variable of interest, then the last step for equation three, the independent variable which was identified as the proposed mediator was entered into the equation.

Baron and Kenny (1986), state that four criteria should be fulfilled in order to establish a mediating relationship.

(1) The independent and mediator variables should have a significant relationship.

(2) The mediator and dependent variable should have a significant relationship.

(3) The independent and dependent variable should have a significant relationship.

(4) The independent variable should not have a significant relationship, or should have a reduced association with the dependent variable, after controlling for the mediator.

The results are reported in Tables 5 - 8. The standardized coefficient Beta (β) is reported and the total variance explained at each step is provided by R^2, R^2 Δ and Adj. R^2.

Hypothesis 4a. It was hypothesised that social support mediated the physical health and physical activity relationship. A summary of the results is reported in Table 5.

Equation one

Physical health was the independent variable and social support was the dependent variable.

At step one, social support was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 119.017$, $p < .001$. The control variables explained 9% of the variance in social support (Adj. $R^2 = .099$). The following control variables were

significantly related to social support: SES status, ($p < .001$), retirement status ($p < .01$) and gender ($p < .001$).

At step two, physical health was entered into the equation. R was significantly different from zero, $F(6,5382) = 102.228$, $p < .001$. Physical health explained an additional 1% of the variance in social support, therefore, these variables accounted for 10% of the variance (Adj. $R^2 = .101$). Physical health was significantly related to social support ($\beta = .056$), $p < .001$. Criterion one was satisfied. The following control variables were significantly related to social support: SES ($p < .01$), retirement status ($p < .01$) and gender ($p < .001$).

Equation two

Social support was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 11.509$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

At step two, social support was entered into the equation. R was significantly different from zero, $F(6,5382) = 17.002$, $p < .001$. Social support explained an additional 1% of the variance in physical activity, therefore these variables accounted for nearly 2% of the variance (Adj. R^2 .018). Social support was significantly related to physical activity ($\beta = .094$), $p < .001$. Criterion two was satisfied. The following control variables were significantly related to physical activity: SES ($p < .01$) and gender ($p < .001$).

Equation three

Physical health was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 11.509$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

At step two, physical health was entered into the equation. R was significantly different from zero, $F(6,5382) = 43.873$, $p < .001$. Physical health explained an additional 3% of the variance in physical activity, therefore these variables accounted for nearly 5% of the variance (Adj. R^2 .046). Physical health was significantly related to physical activity ($\beta = .204$), $p < .001$. Criterion three was satisfied. The following control variables were significantly related to physical activity: retirement status ($p < .01$), age ($p < .05$) and gender ($p < .001$).

At step three, social support was entered into the equation. R was significantly different from zero, $F(7,5381) = 42.937$, $p < .001$. Social support explained an additional 1% of the variance in physical activity, therefore these variables accounted for 5% of the variance (Adj. R^2 .052). Physical health still had a significant relationship with physical activity ($\beta = .199$), $p < .001$, whilst controlling for social support. Criterion four for full mediation was not satisfied. The following control variables were significantly related to physical activity after controlling for social support: retirement status ($p < .01$), gender ($p < .001$) and age ($p < .05$).

Table 5

Results of Mediation Test Using Three Hierarchical Regression Equations: Social Support Regressed on Physical Health, Physical Activity Regressed on Social Support and Physical Activity Regressed on Physical Health Then Mediated by Social Support (N = 5,253).

Step and variable	R^2	$R^2 \Delta$	β
Equation 1			
Social support on control variables – step 1	.100***	.100***	
Social support on physical health - step 2	.102***	.003***	.056***
Equation 2			
Physical activity on control variables – step 1	.011***	.011***	
Physical activity on social support – step 2	.019**	.018***	.094***
Equation 3			
Physical activity on control variables – step 1	.010***	.010***	
Physical activity on physical health – step 2	.046***	.036***	.204***
Physical activity on physical health controlling for social support – step 3	.053***	.006***	.199***

Note, Control variables - socioeconomic status, retirement status, age, gender and ethnicity

* $p < .05$, ** $p < .01$, *** $p < .001$

The beta value for physical health and physical activity was lower, showing reduced impact once the mediator was included, suggesting partial mediation. However Frazier, Tix and Barron (2004) urge any partial mediation to be tested for significance. Therefore, this change in beta value was tested by calculating z values using the following 1982 formula by Sobel, as described by Baron and Kenny (1986):

$$z = B_1 \times B_2 / \sqrt{(B1^2 \times SE1^2 + B2^2 \times SE2^2)}$$

B1 represents the unstandardised Beta value and SE1 represents the standard error associated with the independent variable when the first criterion is assessed. B2 represents the unstandardised Beta value and SE2 represents the standard error associated with the mediator variable when the second criterion is assessed. If the resulting z value exceeds 1.96, partial mediation would be significant at the .05 level. An interactive Sobel programme (Preacher & Leonardelli, 2001) was accessed to test the significance of the results. The results for the present hypothesis $z = 3.66$, ($p < .001$) supported partial mediation, as there was a significant reduction in beta.

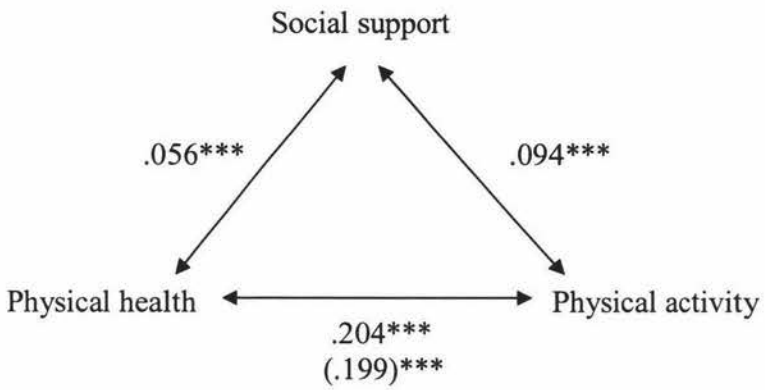

Figure 7. Multiple regressions testing mediation of physical health and physical activity by social support. The coefficients outside the brackets are standardized regression weights (Beta); the value within the bracket is the standardized regression weight when social support was added to the third equation.

Hypothesis 4b. It was hypothesised that social support mediated the mental health and physical activity relationship. A summary of the results is reported in Table 6.

Equation one

Mental health was the independent variable and social support was the dependent variable.

At step one, social support was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 119.017$, $p < .001$. The control variables explained nearly 10% of the variance in social support (Adj. $R^2 = .099$). The following control variables were significantly related to social support: SES ($p < .001$), retirement status ($p = .001$) and gender ($p < .001$).

At step two, mental health was entered into the equation. R was significantly different from zero, $F(6,5382) = 178.470$, $p < .010$. Mental health explained an additional 6% of

the variance in social support, therefore these variables accounted for 16% of the variance (Adj. R^2 .165). Mental health was significantly related to social support ($\beta = .278$), $p < .001$. Criterion one was satisfied. The following control variables were significantly related to social support: SES ($p < .001$), retirement status ($p < .05$), age ($p < .001$) and gender ($p < .001$).

Equation two

Social support was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 11.509$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

At step two, social support was entered into the equation. R was significantly different from zero, $F(6,5382) = 17.002$, $p < .001$. Social support explained an additional 1% of the variance in physical activity, therefore these variables accounted for nearly 2% of the variance (Adj. $R^2 = .018$). Social support was significantly related to physical activity ($\beta = .094$), $p < .001$. Criterion two was satisfied.

The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

Table 6

Results of Mediation Test Using Three Hierarchical Regression Equations: Social Support Regressed on Mental Health, Physical Activity Regressed on Social Support and Physical Activity Regressed on Mental Health Then Mediated by Social Support (N 5,253).

Step and Variable	R^2	$R^2 \Delta$	β
Equation 1			
Social support on control variables – step 1	.100***	.100***	
Social support on mental health - step 2	.166***	.066***	.278***
Equation 2			
Physical activity on control variables – step 1	.011***	.011***	
Physical activity on social support – step 2	.019***	.008***	.094***
Equation 3			
Physical activity on control variables – step 1	.010***	.010***	
Physical activity on mental health – step 2	.036***	.035***	.173***
Physical activity on mental health controlling for social support – step 3	.039***	.002***	.159***

Note. Control variables – socioeconomic status, retirement status, age, gender and ethnicity.

* $p < .05$, ** $p < .01$, *** $p < .001$

Equation three

Mental health was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 11.509$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

At step two, mental health was entered into the equation. R was significantly different from zero, $F(6,5382) = 33.770$, $p < .001$. Mental health explained an additional 2% of the variance in physical activity, therefore these variables accounted for 3% of the variance (Adj. $R^2 = .035$). Mental health was significantly related to physical activity ($\beta = .173$), $p < .001$. Criterion three was satisfied. Only the control variable gender was significantly related to physical activity ($p < .001$).

At step three, social support was entered in the equation. R was significantly different from zero, $F(7,5381) = 30.840$, $p < .001$. The additional percentage explained by social support was less than 1% of the variance in physical activity, therefore these variables accounted for nearly 4% of the variance (Adj. $R^2 = .037$). Mental health still had a significant relationship with physical activity ($\beta = .159$), $p < .001$, whilst controlling for social support. Criterion four for full mediation was not satisfied. The only control variable to be significantly related to physical activity, after controlling for social support was gender ($p < .001$).

The beta value for mental health and physical activity was lower, showing reduced impact once the mediator was included, suggesting partial mediation. This change in beta value was tested with Sobel's formula. The results for the present hypothesis $z = 7.19$, ($p < .001$) supported partial mediation.

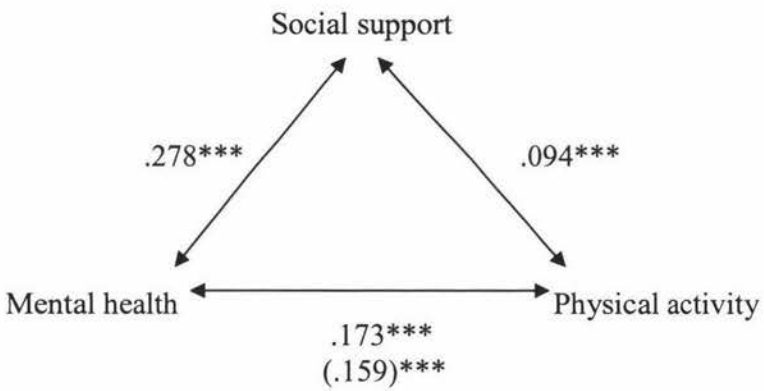

Figure 8. Multiple regressions testing mediation of mental health and physical activity by social support. Coefficients outside brackets are standardized regression weights (Beta); the value within the bracket is the standardized regression weight when social support was controlled for in the third equation.

7.3.5 Hypothesis 5

Hypothesis 5a. It was hypothesised that physical health mediated the social support and physical activity relationship. Summaries of the results are reported in Table 7.

Equation one

Social support was the independent variable and physical health was the dependent variable.

At step one, physical health was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 161.744$, $p < .001$. The control variables explained 13% of the variance in social support (Adj. $R^2 = .130$). The following control variables were significantly related to physical health: SES ($p < .001$), retirement status ($p < .001$), age ($p < .001$), gender ($p < .01$) and ethnicity ($p < .001$).

At step two, social support was entered into the equation. R was significantly different from zero, $F(6,5382) = 137.936$, $p < .001$. The additional variance explained by social support was less than 1% of the variance in physical health, therefore these variables accounted for 13% (Adj. $R^2 = .132$). Social support was significantly related to physical health ($\beta = .054$), $p < .001$. Criterion one was satisfied. The following control variables were significantly related to physical health: retirement status ($p < .001$), SES ($p < .001$), age ($p < .001$), gender ($p < .05$) and ethnicity ($p < .001$).

Equation two

Physical health was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5389) = 11.522$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

Table 7

Results of Mediation Test Using Three Hierarchical Regression Equations: Physical Health Regressed on Social Support, Physical Activity Regressed on Physical Health, Physical Activity Regressed on Social Support Then Mediated by Physical Health (N= 5,253).

Step and Variable	R^2	$R^2 \Delta$	β
Equation 1			
Physical health on Control variables – step 1	.131***	.131***	
Physical health on social support - step 2	.133***	.003***	.054***
Equation 2			
Physical activity on Control variables – step 1	.011***	.011***	
Physical activity on Physical health – step 2	.047***	.036***	.204***
Equation 3			
Physical activity on Control variables – step 1	.011***	.011***	
Physical activity on Social support – step 2	.018***	.008***	.094***
Physical activity on Social support controlling for Physical health – step 3	.053***	.034***	.084***

Note. Control variables – socioeconomic status, retirement status, age, gender and ethnicity.

* $p < .05$, ** $p < .01$, *** $p < .00$

At step two, mental health was entered into the equation. R was significantly different from zero, $F(6,5388) = 43.923$, $p < .001$. Physical health explained an additional 3% of the variance in physical activity, therefore these variables accounted for 4% of the variance (Adj. $R^2 = .046$). Physical health was significantly related to physical activity ($\beta = .204$), $p < .001$. Criterion two was satisfied. The following control variables were significantly related to physical activity: retirement status ($p < .01$), age ($p < .05$) and gender ($p < .001$).

Equation three

Social support was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 11.509$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to social support: SES ($p < .001$) and gender ($p < .001$).

At step two, social support was entered into the equation. R was significantly different from zero, $F(6,5382) = 17.002$, $p < .001$. The additional variance in social support explained less than 1% of the variance in physical activity, therefore these variables accounted for nearly 2% of the variance (Adj. $R^2 = .018$). Social support was significantly related to physical activity ($\beta = .094$), $p < .001$. Criterion three was satisfied. The following control variables were significantly related to physical activity: SES ($p < .01$) and gender ($p < .001$).

At step three, physical health was entered into the equation. R was significantly different from zero, $F(7,5381) = 42.937$, $p < .001$. Physical health explained an additional 3% of

the variance in physical activity, therefore these variables accounted for 5% of the variance (Adj. $R^2 = .052$). Social support still had a significant relationship with physical activity ($\beta = .084$), $p < .001$, whilst controlling for physical health. Criterion four for full mediation was not satisfied. The following control variables were significantly related to physical activity: retirement status ($p < .01$), age ($p < .05$) and gender ($p < .001$).

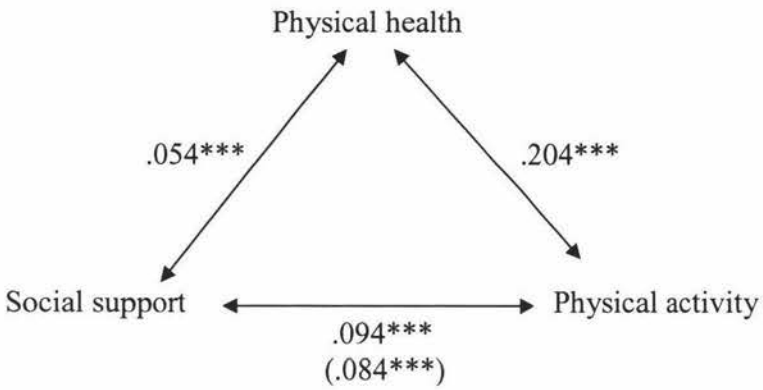

Figure 9. Multiple regressions testing mediation of social support and physical activity by physical health. Coefficients outside brackets are standardized regression weights (Beta); the value within the bracket is the standardized regression weight when physical health was controlled for in the third equation.

The beta value for social support and physical activity was lower, showing reduced impact once the mediator was included, suggesting partial mediation. This change in beta value was tested with Sobel's formula. The results for the present hypothesis $z = 3.98$, ($p < .001$) supported partial mediation.

Hypothesis 5b. It was hypothesised mental health mediated the social support and physical activity relationship. Summaries of the results are reported in Table 8.

Equation one

Social support was the independent variable and mental health was the dependent variable.

At step one, mental health was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 178.550$, $p < .001$. The control variables explained 14% of the variance (Adj. $R^2 = .141$). The following control variables were significantly related to mental health: SES ($p < .001$), retirement status ($p < .001$), age ($p < .001$) and ethnicity ($p < .05$).

At step two, social support was entered into the equation. R was significantly different from zero, $F(6,5382) = 232.020$, $p < .001$. Social support explained an additional 6% of the variance in mental health, therefore these variables accounted for 20% of the variance (Adj. $R^2 = .205$). Social support was significantly related to mental health ($\beta = .265$), $p < .001$. Criterion one was satisfied. The following control variables were significantly related to mental health: SES ($p < .001$), retirement status ($p < .01$), age ($p < .001$), and ethnicity ($p < .05$).

Equation two

Mental health was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5389) = 11.522$, $p < .001$. The control variables explained 1%

of the variance in physical activity (Adj. $R^2 = .01$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

At step two, mental health was entered into the equation. R was significantly different from zero, $F(5,5388) = 33.809$, $p < .001$. Mental health explained an additional 2% of the variance in physical activity, therefore these variables accounted for 3% of the variance (Adj. $R^2 = .035$). Mental health was significantly related to physical activity ($\beta = .173$), $p < .001$. Criterion two was satisfied. The only control variable to be significantly related to physical activity was gender ($p < .001$).

Equation three

Social support was the independent variable and physical activity was the dependent variable.

At step one, physical activity was regressed on the control variables. R was significantly different from zero, $F(5,5383) = 11.509$, $p < .001$. The control variables explained 1% of the variance in physical activity (Adj. $R^2 = .010$). The following control variables were significantly related to physical activity: SES ($p < .001$) and gender ($p < .001$).

Table 8

Results of Mediation Test Using Three Hierarchical Regression Equations: Physical Health Regressed on Social Support, Physical Activity Regressed on Mental Health, Physical Activity Regressed on Social Support Then Mediated by Mental Health (N= 5,253).

Step and Variable	R^2	$R^2 \Delta$	β
Equation 1			
Social support on Control variables – step 1	.141***	.141***	
Mental health on social support - step 2	.206***	.063***	.265***
Equation 2			
Physical activity on Control variables – step 1	.011***	.011***	
Physical activity on Mental health – step 2	.036**	.026***	.173***
Equation 3			
Physical activity on Control variables – step 1	.011***	.011***	
Physical activity on Social support – step 2	.019***	.008***	.094***
Physical activity on Social support controlling for Mental health – step 3	.039***	.020***	.052***

Note. Control variables – socioeconomic status, retirement status, age, gender and ethnicity.

* $p < .05$, ** $p < .01$, *** $p < .001$

At step two, social support was entered into the equation. R was significantly different from zero, $F(6,5382) = 17.002$, $p < .001$. The additional variance explained by social support was less than 1%, therefore these variables accounted for less than 2% of the variance (Adj. $R^2 = .018$). Social support was significantly related to physical activity ($\beta = .094$), $p < .001$. Criterion three was satisfied. The following control variables were significantly related to physical activity: SES ($p < .01$) and gender ($p < .001$).

At step three, mental health was entered into the regression. R was significantly different from zero, $F(7,5381) = 30.840$, $p < .001$. Mental health explained an additional 2% of the variance in physical activity, therefore these variables accounted for 3% of the variance (Adj. $R^2 = .037$). Social support still had a significant relationship with physical activity ($\beta = .052$), $p < .001$, whilst controlling for mental health. Criterion four for full mediation was not satisfied. Gender was the only control variable to be significantly related to physical activity ($p < .001$).

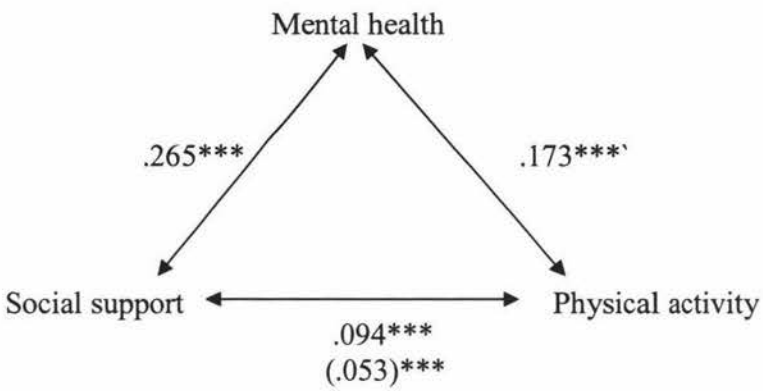

Figure 10. Multiple regressions testing mediation of social support and physical activity by mental health. Coefficients outside brackets are standardized regression weights (Beta); the value within the bracket is the standardized regression weight when mental health was added to the third equation.

The beta value for social support and physical activity was lower, showing reduced impact once the mediator was included, suggesting partial mediation. This change in beta value was tested with Sobel's formula. The results for the present hypothesis $z = 11.44$, ($p < .001$) supported partial mediation.

7.3.6 Hypothesis 6

To test for moderation in hypothesis six, a hierarchical multiple regression was utilised. Firstly, analyses were completed to check the first order correlations. There was an indication the relationship between social support and physical activity was underpinned by gender, as independent *t*-tests identified a significant gender difference in the social support and physical activity relationship.

Table 9

Results of Moderation Test Using Hierarchical Regression Equations: Physical Activity Regressed on Control Variables, Gender and Social Support, and the Interaction Variable Genderxsocial Support. N = 5,253.

Variable and Step	Step 1 β	Step 2 β	Step 3 β
Independent Control variables			
SES	.068*	.035*	.036*
Retirement status	-.027	-.031	-.031
Age	.017	.025	.024
Ethnicity	-.012	-.013	-.013
Independent variables			
Social support		.091***	.168***
Gender		.061***	.063***
The interaction variable			
Genderxsocial support			-.082
R^2	.006***	.018***	.019
Adj. R^2	.005***	.017***	.017
R^2 Δ		.013***	.001

* $p < .05$, ** $p < .01$, *** $p < .001$

Prior to the moderation analysis, social support, the continuous variable was centred to avoid multicollinearity. This process involved subtracting the sample mean of 79.01 to produce revised sample means of zero (Evans & Lepore, 1997; Frazier et al., 2004; Holmbeck, 1997; Tabachnik & Fidell, 2001). The next procedure involved creating a product term to represent the interaction between the predictor and the moderator (genderxsocial support). This was achieved by multiplying gender and the newly centred continuous variable together. A hierarchical regression was used to control for extraneous variables, test the main effects, and then test the interaction effect using the product term. The results of this regression are detailed in Table 9.

Moderation equation

At step one of the regression equation, physical activity was regressed on the control variables, SES, retirement status, age and ethnicity. R was significantly different from zero, $F(4,5383) = 8.259$, $p < .001$. The control variables explained less than 1% of the variance in physical activity (Adj. $R^2 = .005$). Of the control variables, only SES was significant ($p < .001$).

At step two, gender and social support were entered into the equation. R was significantly different from zero, $F(6,5073) = 15,540$, $p < .001$, with gender ($\beta = .061$), $p < .001$ and social support ($\beta = .091$), $p < .001$. The control variables together with gender and social support explained less than 2% of the variance in physical activity (Adj. $R^2 = .017$).

At step three, genderxsocial support was entered in the equation. There was no change in R^2 and the genderxsocial support variable ($\beta = -.082$) was not significant ($p = .061$). The total variance explained was still less than 2%.

CHAPTER EIGHT: DISCUSSION

Introduction

This study, which is ecologically based, was designed to investigate the influences of health, social support and gender on physical activity participation, amongst those aged 55 to 70 years. The hypotheses of positive relationships between, social support and physical activity, physical activity and health, and health and social support, were all supported. Partial mediations were confirmed when social support partially mediated the health and physical activity relationship, and when health partially mediated the social support and physical activity relationship. The proposed gender differences for physical activity, social support and health were supported for just social support and physical activity, with the latter being contrary to international research, as New Zealand women were more active than their male counterparts. Finally, gender did not moderate the social support and physical activity relationship.

This chapter will be divided into eight sections. The results of each of the first three hypotheses will be discussed, then the appropriateness of each measurement tool will be considered, including the strength and possible reason for the results. Thereafter, the two mediating hypotheses will be examined and finally, the gender implications and the moderating relationship will be considered. The limitations of the study and implications for the future of physical activity in New Zealand will then be discussed, followed by a general summary.

8.1 Hypotheses 1, 2 and 3

The first hypothesis stated social support would have a positive relationship with physical activity. This hypothesis was supported with a weak relationship between the two variables. Trost et al. (2002) affirmed every research paper with a social support measure they investigated did identify a positive significant association, but not all relationships were strong.

The second hypothesis stated social support would have a positive relationship with health. This hypothesis was supported with a weak relationship between social support and physical health, and a moderate relationship with social support and mental health. Kasl and Wells (1985) fully concur, adding that the stronger relationship between mental health and social support is due to the complex relationship between the two variables.

The third hypothesis stated health would have a positive relationship with physical activity. This hypothesis was supported with a weak relationship between both physical and mental health. These findings are consistent with previous research (Kahn et al., 2002; Pretty et al. 2003).

8.1.1 Evaluation

All the hypotheses that emanated from international research were supported; therefore we can assume that New Zealanders have similar health, social and physical activity relationships as their international counterparts. The nature of these relationships and an examination of the measures used will now be considered.

Empirical international research utilises many different measures of social support, all with proven reliability and validity. Due to the different scales that can be deployed however, Satariano and McAuley (2003) caution of difficulties when making consensus statements on the nature of the relationships between social support and other variables. As social support is considered a multi-dimensional construct (Driver, 2005; Rhodes et al., 1999), complications can arise when measuring and operationalising the social support variable. The Social Provisions Scale is extensively used and has a huge documented support base in areas of social science research, particularly when investigating physical activity (Driver, 2005). When investigating these relationships several age related factors became apparent. For example, social support from friends and parents appears to be more important for the younger generation (Duncan et al., 2005; Jammu, undated) and for adolescent girls (Springer et al., 2006; Vorhees et al., 2005), and according to Rhodes et al., (1999) as a person ages there is a noted decline in available family or peer social support. As a result, the relationship between social support and physical activity becomes less important. Wills and Shinar (2000) suggest instrumental support is not well represented in the Social Provisions Scale, therefore for those in the senior middle age, there may be a stronger need for the inclusion of an instrumental support measure. Otherwise, the correlational outcome for social support and physical activity will be affected, as instrumental support has a strong relationship with physical activity and older age groups (Weiss, 2005). Minkler (1985) also notes this importance, and declares instrumental support is one of the two most important aspects of social support when examining physical activity. However, there are many types of instrumental support. Previous research has noted that at baseline, instrumental

support is indicative of higher levels of physical activity for those in the older age group (McAuley et al., 2005). Also, Trost et al. (2002) note in particular, that staff/instructor support can be the most effective. However, results from another study (Brassington, Audie, Ruben DiLorenzo, & King, 2002) differ, as no significant relationship between exercise specific social support and physical activity adherence was demonstrated. Nonetheless, the assumption can be made that the Social Provisions Scale may not be the most appropriate scale for this age group.

External factors can also affect these relationships, in particular the health status of a close family member or friend. Rhodes et al. (1999) established that an ailing spouse or friend can act as a barrier to regular exercise, all be it unintentionally. This occurs regardless of the strength of the social support network, as although the social network is still available, inevitably over time, relationships would reduce in strength and importance. Therefore, as has been found internationally, the smaller the social support network, the less physical activity (Jammu, undated). The health of the individual can also alter the affect of these relationships. One factor of prominence according to Kasl and Wells (1985) is that social support changes as health status changes. Also, social support can be viewed, perceived or assessed depending on whether it is readily available or becomes available when required. Therefore, the level of social support may alter, depending on the circumstances, and therefore may not even be objectively assessed. For the age of the participants in the present study, the size and type of social support network, the levels of health and therefore the ability to be physically active differ from other age groups (Weiss, 2004). Although these results cannot be generalised to other

age populations in New Zealand, the results give an indication of the determinants that may be important to other age groups.

Internationally, there are many different scales for physical activity, but the NZPAQ has significance due to the validated use in New Zealand (Moy, 2005). Hence the adoption by SPARC and the Ministry of Health, however, the total effectiveness of this measure is yet to be fully tested in New Zealand. Although the amount of time spent being active is requested, the type of exercise is not investigated. There are indicators from previous research that differing types of activity may have differing results that are age dependent. For example Rutherford (1997) suggests resistance activity is more beneficial for the older age group, and it may be that higher social support is required for resistance training due to the prior organisation that is necessary. On the other hand, as older individuals tend not to be vigorously active (van Alst et al., 2002) the type of activity completed may not need as much social support as other physical activities. In contrast to the weak relationship found with the present study, Anderson et al. (2006) measured hours per week of physical activity (as opposed to activity per day), and found social support and physical activity were then moderately correlated.

In summation, the measures used to investigate the strength of the relationships all identified weak correlations. Therefore these results, which tend to be similar to those identified in the literature review, indicate many similarities with this population's international counterparts. As health deteriorates with ages, any beneficial effects of social support may reduce, as will the opportunity and ability for physical activity.

8.2 Hypotheses 4a and 4b

The results illustrate social support partially mediates the relationship between physical health and physical activity, and mental health and physical activity, after controlling for socioeconomic status, retirement status, age, gender and ethnicity. These results indicate social support does explain some of the relationship between health and physical activity. If the relationship between health and physical activity had reduced to zero, when social support was controlled, full mediation would have been apparent. As partial mediation is evident, with a stronger effect for mental health than physical health, only part of the reason for the level of physical activity is due to the influence of social support.

Lewis, Marcus, Russell, and Dunn (2002) conducted a meta-analysis on social support as a mediator of physical activity, the results of which were contrasting and inconsistent. Therefore social support has not always been identified as a mediator of this relationship. These findings support the critique in section 8.2, which stated contrasting results may be due to the many differing scales and measured deployed, as well as the different age groups included in the comparable studies. Worth noting also, is that the validation of measures is conducted with the long form measures, and the SF36 was utilised in the present study. Finally, socioeconomic status, retirement status, age, gender and ethnicity, may not be the only variables that could be considered as control variables.

8.3 Hypotheses 5a and 5b

The results illustrate physical and mental health partially mediate the relationship between social support and physical activity, after controlling for socioeconomic status,

retirement status, age and ethnicity. These results indicate health explains some of the relationship between social support and physical activity. If the relationship between social support and physical activity had reduced to zero, when health was controlled, full mediation would have been apparent. As partial mediation is evident, with a stronger effect for mental health than physical health, only part of the reason for the level of physical activity is due to the influence of health. A meta analysis conducted by Lewis et al. (2002) on possible mediating relationships found no research projects that consider health as a mediator of physical activity. Therefore these findings provide the first insight into the possibility that health mediates the social support and physical activity relationship.

To summarise, both social support and health were found to be partial mediators. As health effectively increases physical activity by increasing social support, then social support is an important component. As social support effectively increases physical activity by increasing health, then health is an important component. Also, mental health has a slightly stronger relationship than physical health with social support, but not physical activity. However, the results do indicate that mediating relationships are evident, and therefore provide a background for future research.

8.4 Gender

Analyses were conducted to examine the gender differences for each of the main variables. This section discusses the relationships between gender and physical activity, gender and social support and gender and health.

8.4.1 Gender and Physical Activity

The present study reports significantly different levels of physical activity for males and females, with 57% of females and 53% of males meeting the criteria of being sufficiently active. Also, more men than women were found to be sedentary. These results contrast international research (Brown, 2005; Carr et al., 2003; O'Brien-Cousins, 2000; Pretty et al., 2003; USDHSS, 2002; Weiss, 2004) and research in New Zealand (MOH, 2004) that regularly finds males to be more active than females. However, differing research results can and do occur, as one research project by Anderson et al. (2006) established activity levels for males and females were not always significantly different. There are various reasons why these contrasting results can occur, as different activity scales, age groups and populations are involved.

The measure for the present study assesses physical activity each day over a seven day period. It may be that men on average are more active than women, but that they are more active during weekends. Therefore, whilst these results give an indication of physical activity participation for males and females, they are not truly comparable, unless a daily diary was able to indicate when each gender was active. Further reasons for the men in the present study being less active than women, may be that New Zealand men eschew the vanity based results that males overseas quest (Sherwood & Jeffery, 2000). It may also be that New Zealand women, to contrast Burton et al. (1999), actually enjoy physical activity more than males. As 29% of the women, and 19% of the men were completely retired in the present study, and as many new gyms are now situated in urban areas, more available time and easier access may make it easier for

women to be more active. In Britain for example, in the last thirty years, the number of gyms has doubled (Pretty et al., 2003). The location of gyms and centres for physical activity is important, as proximity to a gym is a central factor when considering becoming active (Sherwood & Jeffery, 2000).

8.4.2 Gender and Social Support

Women have significantly more social support available to them than men, and these results are similar to those established internationally (Brawley et al., 2003; de Bourdeaudhuij & Sallis, 2002; Hale et al., 2005). In support of these findings, Hale et al. suggested females have more intimate and close social relationships, whereas according to Lyons and Chamberlain (2006) men have larger social networks and affiliations and tend not to seek close social support. The traditional male gender role can be characterised as excluding any vulnerability (Moller-Leimkuhler, 2002), therefore men do not seek social support to boost confidence. However, as McAuley et al. (2003) state, as men require higher levels of social support to increase activity levels, interventions for men should also include an element of social support. In light of these findings, credence can be given to Sherwood and Jeffery (2000) who postulate the initial emphasis of any intervention should be on group activities, thereby increasing the chance for social support. In support, Brawley et al. (2003) similarly suggest the inclusion of any social component in physical activity interventions would lead to an increase in participant levels.

8.4.3 Gender and Health

International research has identified males are healthier than females (Hale et al., 2005; O'Brien-Cousins, 2000; USDHSS, 2002), but the present study does not support these findings, as no significant difference was found. However, this study does support research conducted by Pretty et al. (2003) who established that regardless of gender, better physical and mental health is related to physical activity (Pretty et al., 2003).

Gender appears to have an affect on the manner in which certain aspects of health are considered, but this may differ across nations. Therefore, when examining research that incorporates a gender disparity, the results should be considered in light of cultural, biological and behavioural influences that may differ in the population of interest. Hale et al. (2005) suggest the expected health benefits of physical activity are viewed through a women's psychological sense of health, as women know physical activity is good for them, and are more emotionally focused than men. Whilst men may be more connected to their physical sense of health and relate soley to physical symptoms, so they may not exercise until they are ill. Circumstance can also influence gender disparities in health. As the main caregivers, women have more opportunity to attend medical consultations and therefore can be more "diagnosed" than men, and according to Lyons and Chamberlain (2006) find illness reporting easier. Also, there are disparities in the types of illnesses that occur for men and women. Lee and Jones (2002) found men were more overweight and smoke and drink more, thereby increasing the possibility of death at a younger age than women. However, regardless of these gender differences, both men and women can improve their health by being physically active.

To summarise this section, the present study concurs with international research that women have more social support than men, but does not support the research that states men are healthier than women, as no significant differences were found. Also in contrast to previous research, the present study found women were more physically active than men

8.5 Hypothesis 6

The results do not support the hypothesis that gender moderates the social support and physical activity relationship ($p = .061$) therefore, the relationship cannot be said to be affected enough by gender to be statistically significant. The rationale for conducting this moderating analysis was based on the statistically significant difference in social support and physical activity that was identified for males and females in international research. The present study found the relationships were also statistically different and women had higher levels of social support than men, but women were found to be more physically active than men. Research though does support the possibility of a moderating relationship. For example, Hale et al. (2005) suggest social support may affect physical activity by influencing men and women differently. They also postulate the benefits of physical activity are viewed through a women's psychological sense whereas men are more connected through their physical sense of health. Therefore, if women know that social support helps physical activity they may act on this, but men would have to wait for physical symptoms of ill health before they considered activity. Using gender as a moderator does have analytical consequences however. Evans and Lepore (1997) warn any results may be marred when an attribute variable such as gender is deployed, as

gender may be a proxy for some other unspecified variable. Also, to increase the amount of unique variance identified, other control variables may need to be included.

8.6 Limitations

The associations found between the variables were weak and the conclusions drawn must be therefore viewed with caution. Also, as the participants are in the 55 to 70 year age group, extending the results to other populations should be tentative. Nonetheless the results do indicate the importance that the proposed relationships have for this age group.

8.6.1 Design

Method

Whilst the present study and the resulting findings inform researchers, the measures and methods deployed may not be the most effective. As this study is cross sectional and therefore not able to demonstrate directionality amongst variables, the use of a prospective study may be more appropriate. For example, Lewis et al. (2002) suggest that a prospective study is more effective when assessing mediator effects when utilising the Baron and Kenny model. And, a longitudinal sample can provide a much higher level of control over confounds. Also, as the measures used are all self-report and therefore, according to Petosa et al. (2003) susceptible to bias, fellow researchers must be aware of the implications when assessing the result.

Measures

As physical activity is an integral part of the present study, the difficulties when assessing levels of physical activity are evident when considering which measurement tool to

include. Duncan et al. (2005) stated there were over 30 different measures of physical activity. For various reasons, not all of these would be appropriate for each population. Amongst these measures can be self report by diary, peer report, professional measurement or the inclusion of instruments such as pedometers or accelerometers. These would all result in a different measurement result for physical activity. Moreover, the assessing of social support is also complicated, due to the cognitive base and the dependence on many situation and time dependent external factors (Adams et al., 2000). As instrumental support appears to be important for those in the senior middle age, a measurement tool other than the Social Provisions Scale may be more effective. The responses, for some individuals may be subjectively based, and there is no consideration to actually specify the source or actual type of social support, or whether it is real or perceived. The measurement tool for health is also self-report and therefore is open to bias. Although some health tools are professionally administered and indicate physiological health, the SF-36 assesses lifestyle health that actually fits neatly with the ecological model. However, future New Zealand research may warrant use of the newly adapted Australasian version, the HRQoL (Ni Mhurchu, Bennett, Lin, Hackett, & Jull et al., 2006).

Sample size

A large sample (the present study, N = 6,413) can often yield incorrect significant results, due primarily to the large sample size, and not the effect measured. Therefore, it is possible with a sufficiently large sample, that extremely small and non-notable differences can be found to be statistically significant. Statistical significance does not say anything about the practical significance of a difference.

8.6.2 Lifestyle

Negative health indicators

Bad diet, weight, smoking, alcohol or drug intakes have not been considered in this present study. As weight status correlates negatively with levels of physical activity (Sherwood & Jeffery, 2000) weight may be a variable that should be considered, as a poor diet is one of the strongest indicators of obesity (Pretty et al. 2003). Similarly, alcohol and drug intake negatively affect health and physical activity.

Barriers

Brown (2005) states there are 14 perceived barriers on the Exercise Benefits/Barriers Scale. By not considering them all, there is the probability that some of the variance will not be identified. The rationale of perceived barriers being frequent predictors of health behaviours, coupled with the controlling for one or more barriers, can lead to the possibility of a greater understanding of the relationship.

Environment

Other considerations that fall beyond the scope of this study are differences in the physical environment for each individual. The physical environment is an integral part in the ecological model, and was not able to be included in the analyses. In future, environmental determinants may be included in studies of this nature, as many environmental situations can affect health, social support and physical activity, particularly for those of an older generation (Rhodes et al. 1999). The questionnaire did not consider specific living arrangements, as different behavioural settings can yield different results (King, et al., 2002). Their results suggest environmental factors, for example when parking accessibility is good, can promote higher levels of physical

activity. Distance from where activity will take place can also affect levels of physical activity. According to Giles-Corti and Donovan (2002), there is an inverse relationship between physical activity and distance traveled and Sherwood and Jeffery (2000) found a moderate relationship between access to facilities and physical activity. Whether the individual lives in an urban or a rural area can also affect the levels of physical activity. One recent concept "biophilia" (Pretty et al., 2003) suggests a connectedness with nature increases the likelihood of better health practices, including physical activity, therefore suggesting that those living in rural areas may exhibit higher levels of physical activity.

8.7 Implications for future research and social policy in New Zealand

These results provide an important first step towards understanding these relationships within the New Zealand domain for this age group, and therefore provide a backdrop for future study. Sedentariness has become a significant public health issue for western countries (SPARC, 2001; USDSS, 1996) and further research in this area could provide interventions that will improve the health and lifestyles of the participants, by increasing the levels of physical activity participation. With an increasing awareness of the need to implement measures targeting the problem, government bodies, health officials, sports trusts, sporting organisations, parents and teachers will need to build a knowledge of the steps that can be taken to arrest the decline. Future research could also deploy different measurement tools and methods. With the various calls for a more ecologically based methodology, researchers could consider domains that have not previously been considered. These could include environmental variables that have to date, largely been ignored and therefore, not previously been adequately examined. Further support for a

broader approach could emanate from Te Whare Tapa Whā, as this model can easily be allied to the ecological model, and it is culturally based. However, further variables would need to be included, as the ecological approach does not include te wairua (spirituality). Expanded research would significantly contribute to our current understanding of physical activity and the ensuing benefits. Fitting neatly with this premise, is the knowledge that the ecological model operates at the preventive level, and this stance is more effective for the individuals and stakeholders, as well as for the health system.

Future research should build on these findings to identify any additional factors that the senior middle age may associate with being sufficiently active. Focus groups may be a useful tool to increase the current knowledge about the benefits of physical activity. As any activity is beneficial, an intervention that actually increases physical activity participation will benefit the individual by ameliorating the health of those heading into their twilight years. As the present study identified women were more active than men, perhaps initiatives that target men in particular may be instigated. Many initiatives such as this, tend to target women. Also, initiatives could be targeted at the age groups that are nearing retirement, so that they will be able to be healthier in their older age. Once people are active, maintenance levels can then be investigated. Although studies have considered maintenance for up to twelve months (Brawley et al. 2003), further longitudinal research is required.

8.8 Conclusion

Internationally, the OECD countries are experiencing a decline in physical activity participation, which has lead to an increasing incidence of illness. Collectively known as the "Big Five", these include; heart disease, stroke, cancer, chronic respiratory illness and diabetes. Coupled with an increase in longevity and a decrease in fertility rates, our populations are aging, hence the need to improve the levels of health.

When attempting to understand the relationships between social support, health, gender and physical activity, the present study found the ecological model was a useful tool to deploy. The literature review highlighted the low and reducing physical activity participation levels, which indicated more information on the benefits of physical activity needs to be disseminated. All but one of the results of the analyses conducted in the present study concurred with international research. When endeavouring to bring about an increase in physical activity levels for this age group aged 55 to 70 years of age, interventions should aim to positively increase the levels of social support and health. Although gender was not strong enough to moderate the social support and physical activity relationship, gender was a significant control variable for each of the mediating relationships and can be taken into account when designing physical activity interventions.

REFERENCES:

Adams, M. H., Bowden, A. G., Humphrey, D. S., & McAdams, L. B. (2000). Social support and health promotion lifestyles of rural women. *Journal of Rural Nursing and Health Care, 1*(1), 1-16.

Ajzen, I, (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes, 50,* 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behaviour.* Englewood Cliffs, New Jersey: Prentice Hall.

Alpass, F., Stephens, C., Towers, A., Stevenson, B., Fitzgerald, E., & Davey, J. (2007). *Older workers and their expectations about retirement adjustment.* Proceedings of the New Zealand Association of Gerontology Conference, Hamilton, New Zealand. PDF retrieved July 14, 2008, from http://hwr.massey.ac.nz/publications.htm.

Anderson, E., Wojcik, J. R., Winett, R. A., & Williams, D. M. (2006). Social-cognitive determinants of physical activity: the influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study. *Health Psychology, 25*(4), 510-520.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice Hall.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Bauman, A., McLean, G., Hurdle, D., Walker, S., Boyd, J., van Alst, I., et al. (2003). Evaluation of the national "Push Play" campaign in New Zealand - Creating population awareness of physical activity. *The New Zealand Medical Journal, 116,* 1-11.

Bauman, A.E., Sallis, J.F., Dzewaltowski, D.A., & Owen, N. (2002). Toward a better understanding of the influences on physical activity. *American Journal of Preventive Medicine, 23*(Suppl. 2), 5-14.

Belza, B., Walwick, J., Shiu-Thornton, S., Schwartz, S., Taylor, M., & LoGerfo, J. (2004). Older adult perspectives on physical activity and exercise: Voices from multiple cultures. *Preventing Chronic Disease Public Health Research Practice and Policy, 1*(4), 1-12.

Berkman, L. F., (1985). The relationship of social networks and social support to morbidity and mortality. In S. Cohen, & S. Syme, (Eds) *Social support and health*. Orlando: Academic Press Inc.

Berrigan, D., & Troiano, R. P. (2002). The association between urban form and physical activity in U.S. adults. *American Journal of Preventive Medicine,* (Suppl. 2), 74-79.

Booth, M.L., Owen, N., Bauman, A., Clavisi O., & Leslie, E. (2000). Social-cognitive and perceived environmental influences associated with physical activity in older Australians. *Preventive Medicine, 31*, 15-22.

Brassington, G.H., Audie, A.A., Ruben E.P., DiLorenzo, T. M and King, A. C. (2002). Intervention-related cognitive versus social mediators of exercise adherence in the elderly. *American Journal of Preventive Medicine, 23*(Suppl. 2), 80-86.

Brawley, L. R., Rejeski, J., & King, A. C. (2003). Promoting physical activity for older adults: The challenges for changing behavior. *American Journal of Preventive Medicine, 25*(3,Suppl. 2), 172-183.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, July,* 513-531.

Brown, S. (2005). Measuring perceived benefits and perceived barriers for physical activity. *American Journal of Health Behavior, 29*(2), 107-116.

Burchfiel, C. M., Sharp, D. S., Curb, J. D., Rodriguez, B. L., Hwang, L. J., Marcus, E. B., et al. (1995). Physical activity and incidence of diabetes: The Honolulu heart program. *American Journal of Epidemiology, 141*(4), 360-368.

Burton, L. C., Shapiro, S., & German, P. S. (1999). Determinants of physical activity initiation and maintenance among community-dwelling older persons. *Preventive Medicine, 29*(5), 422-430.

Carr, H. (2001). *Physical activity and health: The benefits of physical activity on minimising risk of disease and reducing disease morbidity and mortality*: Hillary Commission for Sport, Fitness and Leisure.

Cohen, S., Underwood, L., & Gottlieb, B (2000). *Social Support Measurement and Intervention*. Oxford: University Press.

Conn, V. S., Tripp-Reimer, T., & Maas, M., L. (2003). Older women and exercise: Theory of planned behavior. *Public Health Nursing, 20*(2), 153-163.

Costanzo, C., Walker, S. N., Yates, B. C., McCabe, B., & Berg, K. (2006). Physical activity counseling for older women. *Western Journal of Nursing Research, 28*(7), 786-801.

Cousins, S. (1995). Social support for exercise among elderly women in Canada. *Health Promotion International, 10*, 273-282.

Cutrona, C., & Russell, D. (1987). *The provisions of social relationships and adaptation to stress.* Greenwich, CT: JIA Press.

Davidson, O. (2007). *Understanding and influencing sexual and reproductive health.* Retrieved 310308 from http://www.nzshs.org/uploadfiles/nzshs/1115-1230%20Oliver%20 Davidson. PDF.

de Bourdeaudhuij, I., & Sallis, J. (2002). Relative contribution of psychosocial variables to the explanation of physical activity in three population-based adult samples. *Preventive Medicine, 34*, 279-288.

Dean, K., Holst, E., Kreiner, S., Schoenborn, C., & Wilson, R. (1994). Measurement issues in research on social support and health. *Journal of Epidemiological Community Health, 48,* 206-210.

Deiner, E. (1984). Subjective well-being. *Psychological Bulletin, 95*, 542-575.

Department of Health and Aging. (2006). *Australian SF-36 V2 Norms and the Impact of Incontinence on Health Status*. Canberra: National Continence Management Strategy:An Australian Government Initiative.

Dishman, R. K. (1994). Motivating older adults to exercise. *Southern Medical Journal, 87*(5), 579-582.

Dishman, R. K., Motl, R. W., Sallis, J. F., Dunn, A. L., Birnbaum, A. S., Welk, G. J., et al. (2005). Self-management strategies mediate self-efficacy and physical activity. *American Journal of Preventive Medicine, 29*(1), 10-18.

Driver, S. (2005). Social support and the physical activity behaviours of people. *Brain Injury, 19*(13), 1067-1075.

Duncan, S., Duncan, T., & Stryker, L. (2005). Sources and types of social support in youth physical activity. *Health Psychology, 24*(1), 3 -10.

Durie, M. (1998). *Te Mana, te Kawantanga: The Politics of Māori Self-Determination.* Oxford Press: Auckland.

Emery, C. F., Hauck, E. R., & Blumenthal, J. A. (1992). Exercise adherence or maintenance among older adults: 1-year follow up study. *Psychological Aging, 7*, 466-470.

Ettinger, J., Burns, R., & Messier, S. P. (1997). A randomised trial comparing aerobic exercise and resistance exercise with a health education program in older adults with knee osteoarthritis. *Journal of American Medical Association, 277,* 25-31.

Evans, G.W., & Lepore, S .J. (1997). Moderating and mediating processes in environment – Behaviour research. In G.T. Moore & R.W. Evans (Eds). *Advances in environment behaviour and design.* Plenum Press: New York.

Fabrigoule, C. (2002). Do leisure activities protect against alzheimers disease? *The Lancet Neurology, 1*, 11.

Fallon, E. A., & Hausenblas, H. A. (2004). Transtheoretical Model: Is termination applicable to exercise? *Journal of Human Movement Studies, 40*, 465-479.

Ferrucci, L., Izmirlian, G., Phillips, C., Corti, M., & Brock, D. (1999). Smoking, physical activity, active life expectancy. *American Journal of Epidemiology, 149*(7), 645-653.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology. *Journal of Counseling Psychology, 51,* 115-134.

Friedrich, M., Gittler, G., Halberstadt, Y., Cermak, T., & Heiller, I. (1998). Combined exercise and motivation program: Effect on the compliance and level of disability of patients with chronic low back pain: A randomised trial. *Archives of Physical Medicine and Rehabilitation, 79*, 475-489.

Giles-Corti, G., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science and Medicine, 54*(12), 1793-1812.

Gilmour, G., & Snell, P. (2006). *Use it or lose it*. New Zealand: Penquin Books.

Girling-Butcher, R. (2006). Influences on the stages and processes of exercise adoption in women. *Australian Society of Rehabilitation Counselors, 12*(2), 110-123.

Godin, G., Lambert, L., Owen, N., Nolin, B., & Prud'homme, D. (2004). Stages of motivational readiness for physical activity: A comparison of different algorithms of classification. *British Journal of Health Psychology, 9*, 253-267.

Hakim, A., Curb, J., Petrovich, H., Rodriquez, B., Yono, K., Ross, J., et al. (1999). Effects of walking on coronary heart disease in elderly men: The Honolulu heart programme. *Journal of the American Heart Association, 100*(1), 9-13.

Hale, C. J., Hannum, J., & Espelage, D. (2005). Social support and physical health: The importance of belonging. *Journal of American College Health, 53*(6), 276-284.

Hancox, R. (2004). Association between child and adolescent television viewing and health: A longitudinal birth cohort study. *Lancet, 364*(9430), 257-262.

Hillsdon, M. M., Brunner, E. J., Guralnik, J. M., & Marmot, M. G. (2005). Prospective study of physical activity and physical function in early old age. *American Journal of Preventive Medicine, 28*(3), 245-250.

Holmbeck, G.N. (1997). Toward terminological, conceptual and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*(4), 599-610.

IPAQ Research Committee. (2005). *Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire.* Retrieved 100707, from http://homepage.univie.ac.at/heinz.freisling/downloads/IPAQ%20LS%20Scoring%20Protocols_Nov05.pdf.

Jacobson, D. M., Strohecker, L., Compton, M. T., & Katz, D. L. (2005). Physical activity counseling in the adult primary care setting: Position statement of the American College of Preventive Medicine. *American Journal of Preventive Medicine, 29*(2), 158-162.

Jammu, N. (undated). Social support and physical activity. Retrieved 160407, from www.usc.edu/programs/ugprograms/ugresearch/documents/urp2002.

Jensen, J., Spittal, M., Crichton, S., & Krishnan, V. (2002). *ELSI short for: User manual for a direct measure of living standards.* Wellington: Ministry of Social Development.

Jones, W. K. (2003). Understanding barriers to physical activity is a first step in removing them. *American Journal of Preventive Medicine, 25*(3, Suppl.1), 2-4.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, et al. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American Journal of Preventive Medicine, 22*(4, Suppl.1), 73-107.

Kaholokula, J. K., Haynes, S. N., Grandinetti, A., & Chang, H. K. (2006). Ethnic differences in the relationship between depressive symptoms and health related quality of life in people with type 2 diabetes. *Ethnicity and Health, 11*(1), 59-80.

Kang, J. (2003). *Psychometric characteristics of two health measures in relation to older adults cognitive functioning: A secondary analysis.* University of Texas: Austin.

Kaplan, G. A., Seeman, T. S., Cohen, R. D., Knudsen, L. P., & Guralnik, J. (1987). Mortality among the elderly in the Alameda County Study: Behavioural and demographic risk factors. *American Journal of Public Health, 77*(3), 307-312.

Kasl, S. V. & Wells, J. A. (1985). Social support and health in the middle years: Work and the family. In C. Cohen & L. Syme (Eds.), *Social support and health* (pp.175 – 192). Orlando: Academic Press Inc.

Kelsey, K. S., De Vellis, B. M., Begum, M., Belton, L., Hooten, E. G., & Campbell, M. K. (2006). Positive affect, exercise and self-reported health in blue collar women. *American Journal of Behavior, 30*(2), 199-207.

Kessler, R. C. (2003). Epidemiology of women and depression. *Journal of Affective Disorders, 74*, 5-13.

King, A. C., Bauman, A., & Abrams, D. B. (2002). Forging transdisciplinary bridges to meet the physical inactivity challenge in the 21st century. *American Journal of Preventive Medicine, 23*(Suppl. 2), 104-106.

King, A. C., Stokols, D., Talen, E., B., Brassington, G. S., & Killingsworth, R. J., (2002). Theoretical approaches to the promotion of physical activity: forging a transdisciplinary paradigm. *American Journal of Preventive Medicine, 23*(2, Suppl. 1), 15 - 25.

Kingi, D., Towers, A. J., Seebeck, R. F., & Flett, R. A. (2005). Pacific women's decisions about exercise adoption: utilising the stage-of-exercise-adoption model. *The New Zealand Medical Journal, 118*(1216), 1-9.

Krawczynski, M., & Olszewski, H. (2000). Psychological well-being associated with a physical activity programme for persons over 60 years old. *Psychology of Sport and Exercise, 1*(1), 57-63.

Kukutai, T. (2004) The problem of defining an ethnic group for public policy: Who is Māori and why does it matter? *Social Policy Journal of New Zealand 23,* 86 – 108.

Lawlor, D., & Hopker, S. (2001). The effectiveness of exercise as an intervention in the management of depression: a systematic review and meta-regression analysis of randomised controlled trials. *British Medical Journal, 322*(763), 1-8.

Lawlor, D., Keen, S., & Neal, R. (1999). Increasing population levels of physical activity through primary care: GP's knowledge, attitudes and self-reported practice. *Family Practice, 16*(3), 250-255.

Lee, I. M., Hennekens, C. H., Berger, K., Buring, J. E., & Manson, J. E. (1999). Exercise and risk of stroke in male physicians. *Stroke, 30*(1), 1-6.

Lee, C. & Owens, R. G. (2002). *Health Psychology*. Buckingham: Open University Press.

Lee, Y., & Park, K. (2006). Health practices that predict recovery from functional limitations in older adults. *American Journal of Preventive Medicine, 31*(1), 25-31.

Levielle, S., Guralnik, J., Ferucci, L., & Langlois, J. (1999). Aging successfully until death in old age: Opportunities for increasing life expectancy. *American Journal of Epidemiology, 149*(7), 654-664.

Lewis, B.A. Marcus, B.H. Russell, R. P & Dunn, A.K. (2002). Psychosocial mediators of physical activity behaviour among adults and children. *American Journal of Preventive Medicine, 23* (Suppl. 2), 26-34.

Li, F., Fisher, J., Harmer, P., & McAuley, E. (2002). Delineating the impact of tai chi training on physical function among the elderly. *American Journal of Preventive Medicine, 23*(Suppl 2), 92-97.

Lyons, A. C., & Chamberlain, K. (2006). *Health psychology: A critical introduction.* United Kingdom: Cambridge University Press.

MacAuley, D. (1999). *Benefits and hazards of exercise*. London: British Medical Journal Books.

Manson, J. E., & Spelsberg, A. (1994). Primary prevention of non-insulin-dependent diabetes mellitus. *American Journal of Preventive Medicine, 10*(3), 172-184.

Marks, D.F., Murray, M., Evans, & Willig, C. (2000). *Health Psychology.* London: Sage.

Mazzeo, R. S., Cavanagh, P., Evans, W., Fiatarone, M., Hagberg, J., McAuley, E., et al. (1998). ACSM position stand: Exercise and physical activity for older adults. *Medicine and Science in Sports and Exercise, 30*(6), 992-1008.

McAuley, E., Elavsky, S., Jerome, G., Elavsky, S., Marquez, D., & Ramsey, S. (2003). Predicting long-term maintenance of physical activity in older adults. *Preventive Medicine, 37*, 110-118.

McAuley, E., Elavsky, S., Jerome, G., Konopack, J., & Marquez, D. (2005). Physical activity-related well-being in older adults: Social cognitive influences. *Psychology and Aging, 20*(2), 295-302.

McLean, G., & Tobias, M. (2004). *The New Zealand physical activity questionnaires: Report on the validation and use of the NZPAQ-LF and NZPAQ-SF self-report physical activity survey instruments.* New Zealand: SPARC.

McMurdo, M., & Rennie, L. (1993). A controlled trial of exercise by residents of old people's homes. *Age and Ageing, 22*(1), 111-115.

Minkler, M. (1985). Social support and health of the elderly. In C. Cohen & L. Syme (Eds), *Social support and health* (pp. 199 – 212). London: Academic Press Inc.

Ministry of Health. (2004). *A portrait of health: Key results of the 2002/2003 New Zealand Health Survey.* Wellington: Ministry of Health.

Moller-Leimkuhler, A. M. (2002). Barriers to help-seeking by men: A review of socio cultural and clinical literature with particular reference to depression. *Journal of Affective Disorders, 71,* 1-9.

Moy, K. L. (2005). *Physical activity and fitness measures in New Zealand: A study of validation and correlation with cardiovascular risk factors.* Unpublished Manuscript, Population Health, Auckland.

Murray, C., & Lopez, A. (2002). *The World Health Report - Reducing risks promoting healthy life*: World Health Organisation.

Ni Mhurchu, C., Bennett, D, Lin, R., Hackett, M., Jull, A. et al. (2006). Obesity and health-related quality of life: Results from a weight loss trial. *New Zealand Medical Journal, 117*(1207), 1–9.

O'Brien-Cousins, S. (2000). "My heart couldn't take it". *The Journal of Gerontology Series B, 55*, 283-294.

O'Brien-Cousins, S. (2005). *Overcoming ageism in active living*: Alberta Centre of Active Living.

Paffenbarger, R. S., Hyde, R. T., Wing, A. L., Lee, I. M., & Kampert, J. B. (1986). Physical activity, all-cause mortality and longevity of college alumni. *New England Journal of Medicine, 1994*(314), 605-613.

Preacher, K.P. & Leonardelli, G.J. (2001). Calculation for the Sobel test. Retrieved 040308, from www.psych.ku.edu/preacher/sobel/sobel.htm

Peel, N. M., McClure, R. J., & Bartlett, H. P. (2005). Behavioral determinants of healthy aging. *American Journal of Preventive Medicine, 28*(3), 298-304.

Pelletier, J. R., Nguyen, M., Bradley, K., Johnsen, M., & McKay, C. (2005). A study of a structured exercise program with members of an ICCD certified clubhouse: Program design, benefits, and implications for feasibility. *Psychiatric Rehabilitation Journal, 29*(2), 89-96.

Petosa, R., Suminski, R., & Hortz, B. (2003). Predicting vigorous physical activity using social cognitive theory. *American Journal of Health Behavior, 27*(4), 301-310.

Phongsavana, P., McLean, G. B., & Bauman, A. (2006). Gender differences in influences of perceived environmental and psychosocial correlates on recommended level of physical activity among New Zealanders. *Psychology of Sport and Exercise, 8*(6), 939-950.

Plante, T.G., & Rodin, J. (1990). Physical fitness and enhanced psychological health. *Current Psychology: Research and Reviews, 9,* 3-24.

Poulton, R., Hancox, R, Milne, B., Baxter, J., Scott, K., & Wilson., N. (2006). The Dunedin Multidisciplinary Health and Development Study: are its findings consistent with the overall New Zealand population? *The New Zealand Medical Journal, 119*(1235).

Pratt, M., Macera, C. A., Sallis, J. F., O'Donnell, M., & Frank, L. D. (2004). Economic interventions to promote physical activity: Application of the SLOTH model. *American Journal of Preventive Medicine, 27*(3, Suppl. 1), 136-145.

Pretty, J., Griffin, M., Sellens, M., & Pretty, C. (2003). *Green exercise: Complementary roles of nature, exercise and diet in physical and emotional well-being and implications for public health policy.* Ipswich: University of Essex.

Prochaska, J. O., & Di Clemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, research and practice, 19*(3), 276-288.

Prohaska, T., Belansky, E., Belza, B., Buchner, D., Marshall, V., McTigue, K., et al. (2006). Physical activity, public health, and aging: critical issues and research priorities. *Journal of Gerontology, 61B*, 267-273.

Rejeski, W., & Mihalko, S. L. (2001). Physical activity and quality of life in older adults. *Journal of Gerontology, Series A, 56a*(Special Issue II), 23-35.

Resnick, B. (2001). Prescribing an exercise program and motivating older adults to comply. *Educational Gerontology, 27*, 209-226.

Rhodes, R. J., Martin, A., Taunton, J., Rhodes, E., Donnelly, M., & Elliot, J. (1999). Factors associated with exercise adherence among older adults. *Sports Medicine, 28*(6), 397-411.

Rosenstock, I. M. (1974). Historical origins of the Health Belief Model. *Health Education Monographs, 2,* 328-353.

Rutherford, O. (1997). Bone density and physical activity. *Proceedings of the Nutrition Society, 56*, 967-975.

Sallis, J. F. (1999). *Influences on physical activity of children, adolescents and adults.* USA: San Diego University.

Sallis, J., & Owen, N. (1999). *Physical Activity and Behavioural Medicine*. Thousand Oaks California: Sage.

Sallis, J. F. (2003). New thinking on older adults' physical activity. *American Journal of Preventive Medicine, 25*(3, Supplement 2), 110-111.

Satariano, W. A., & McAuley, E. (2003). Promoting physical activity among older adults: From ecology to the individual. *American Journal of Preventive Medicine, 25*(3, Supplement 2), 184-192.

Saxena, S., van Ommeren, M., Tang, K. C., & Armstrong, T. P. (2005). Mental health benefits of physical activity. *Journal of Mental Health, 14*(5), 445-451.

Schutzer, R. N., & Graves, B. S. (2004). Barriers and motivations to exercise in older adults. *Preventive Medicine, 39*(5), 1056-1061.

Scott, K. M., Sarfati, D., Tobias, M., & Haslett, S. (2000). A challenge to the cross-cultural validity of the SF-36 health survey: Factor structure in Māori, Pacific and NZ European ethnic groups. *Social Science and Medicine, 51*, 1655-1664.

Sheppard, L., Senior, J., Park, C. H., Mockenhaupt, R., Chodzko-Zajko, W. & Bazzarre, T. (2003). The national blueprint consensus conference summary report: Strategic Priorities for increasing physical activity among adults aged > 50. *American Journal of Preventive Medicine, 5*(3 Suppl. 2), 209-213.

Sherwood, N. E., & Jeffery, R. W. (2000). The behavioral determinants of exercise: implications for physical activity interventions. *Annual Review of Nutrition, 20*, 21-44.

Shih, M., Hootman, J. M., Kruger, J., & Helmick, C. G. (2006). Physical activity in men and women with arthritis: National health interview survey, 2002. *American Journal of Preventive Medicine, 30*(5), 385-393.

Singh, N. A., Clements, K. M., & Fiatarone Singh, M.(2001). The efficacy of exercise as a long-term antidepressant in elderly subjects: A randomized controlled trial. *Journal of Gerontology, 56a*(8), 497-504.

Slingerland, A. S., van Lenthe, F. J., Jukema, J. W., Kamphuis, B. M., Looman, C., Giskes, K., et al. (2007). Aging, retirement and changes in physical activity: Prospective cohort findings from the GLOBE study. *American Journal of Epidemiology, 165*, 1356-1363.

Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention-behavior gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology and Health, 20*(2), 143-160.

Sport and Recreation New Zealand (2003). *SPARC Facts - Older adults.* Wellington: SPARC.

Spiegel, D., Bloom, J. R., & Yalom, I. P. (1989). Effects of psychosocial treatment in survival of patients with monastic breast cancer. *Lancet, 2*, 888-891.

Springer, A. E., Kelder, S. H., & Hoelschler, D. M. (2006). Social support, physical activity and sedentary behavior among 6th grade girls; a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity, 3*(8), 1-10.

Statistics New Zealand (2002). National trends in longevity and mortality. Retrieved 010507 from www.stats.govt.nz-life-tables.

Statistics New Zealand (2007). Births, Deaths and Marriages. Retrieved 300507, from www.stats.govt.nz.

Stephens, C., Alpass, F., Noone, J.H., Towers, A., Stevenson, B., Fitzgerald, E., et al. (2007). *Social networks and health among the young-old*. Proceedings of the New Zealand Association of Gerontology Conference, Hamilton, New Zealand. PDF retrieved July 14, 2008, from http://hwr.massey.ac.nz/publications.htm.

Stephens, T. (1988). Physical activity and mental health in the United States and Canada: Evidence from four population surveys. *Preventive Medicine, 17*(1), 35-47.

Stewart, A. L., Verboncoeur, C. J., McLellan, B. Y., Gillis, D. E., Rush, S., Mills, F. M., et al. (2001). Physical activity outcomes of CHAMPS II: A physical activity promotion program for older adults. *Journal of Gerontology, 56A*(8), 465-470.

Sullivan, C., Oakden, J., Young, J., Butcher, H., & Lawson, R. J. (2003). *Obstacles to Action - A Study of New Zealanders' Physical Activity and Nutrition*. New Zealand: SPARC.

Sundquist, K., Qvist, J., Sundquist, J., & Johansson, S. E. (2004). Frequent and occasional physical activity in the elderly: A 12-year follow-up study of mortality. *American Journal of Preventive Medicine, 27*(1), 22-27.

Tabachnik, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics*. USA: Allyn & Bacon.

Taubes, G. (2008). Exercise for health, not weight control. *Headlines, 79*(Autumn), 11-15.

Towers, A. J., Flett, R. A., & Seebeck, R. F. (2005). Assessing potential barriers to exercise adoption in middle-aged men: Over-stressed, under-controlled, or just too unwell? *International Journal of Men's Health, 4*(1), 13-23.

Towers, A.J. (2007). Health, work and retirement study: Methodology. Retrieved 260608 from www.hwr.massey.ac.nz/resources/methodology_towers.pdf

USDHSS. (1996). *Physical activity and health: A report of the Surgeon General.* US Department of Health and Human Services, Centre for Disease Control and Prevention.

USDHSS. (2002). *Physical activity fundamental to preventing disease*: US Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation.

van Alst, I., Kazakov, D., & McLean, G. (2002). SPARC Facts. New Zealand: SPARC.

van de Velde-Coke, S. (2004). *The effectiveness and efficiency of providing homecare visits in nursing clinics versus the traditional home setting*: Canadian Health Services Research Foundation.

Vorhees, C. Murray, D. Welk, G. Birnbaum, A. Ribisl. K. et al.(2005). The role of peer social network factors and physical activity in adolescent girls. *American Journal of Health Behaviour, 29*(2), 183–190.

Vuillemin, A., Boini, S., Bertrais, S., Tessier, S., Oppert, J. M., Hercberg, S., et al. (2005). Leisure time physical activity and health-related quality of life. *Preventive Medicine: An International Journal Devoted to Practice and Theory, Vol 41(2),* 562-569.

Wang, H., Walls, H., Blakey, K., & Green, R. (2006). *Older People's Health Chart Book 2006.* Wellington: Ministry of Health

Ware, J., & Sherbourne, C. (1992). The SF36 item short form health survey (SF-36). *Medical Care, 30*(6), 473-483.

Ware, J. E. (2000). SF-36 Health Survey Update. *Spine, 24*(24), 3130–3139.

Wills, T, A. & Shinar, O. (2000). Measuring Perceived and Received Social Support. In S. Cohen, L. Underwood, & B. Gottlieb (Eds.) *Social support measurement and intervention.* Oxford: University Press.

Weiss, M. (2004). *Developmental Sport and Exercise Psychology: A Lifespan Perspective.* USA: Fitness Information Technology Inc.

Welsh, L., & Rutherford, O. (1996). Hip bone mineral density is improved by high-impact exercise in post-menopausal women and men over 50 years. *European Journal of Applied Physiology, 74*, 511-517.

West, P., Reeder, P., Milne, B., & Poulton, R. (2002). Worlds apart: A comparison between physical activity among youth in Glasgow, Scotland and Dunedin, New Zealand. *Social Science and Medicine, 54*(4), 607-619.

WHO, (2007). Chronic diseases and health promotion. Retrieved 140807, from http://www.who.int/chp/en/

Wilcox, S., Castro, C. M., & King, A. C. (2006). Outcome expectations and physical activity participation in two samples of older women. *Health Psychology, 11*(1), 65-77.

Wolinsky, F. D., Stump, T. E., & Clark , D. O. (1995). Antecedents and consequences of physical activity and exercise among older adults. *Gerontologist, 35*(4), 451-462.

Yael, N., Meng-Jia, W., Becker, B. J., & Gershon, T. (2005). Physical activity and psychological well-being in advanced age: A meta-analysis of intervention studies. *Psychology and Aging, 20*(2), 272-284.

APPENDIX

Questions relating to physical activity, social support, health, socioeconomic status, retirement status, age, gender and ethnicity.

HEALTH QUESTIONS

Q 1 **In general, would you say your health is:**
(Please tick one box)

Excellent	1
Very Good	2
Good	3
Fair	4
Poor	5

Q 2 **Compared to one year ago, how would you rate your health in general now?**
(Please tick one box)

Much better than one year ago	1
Somewhat better now than one year ago	2
About the same as one year ago	3
Somewhat worse now than one year ago	4
Much worse now than one year ago	5

Q 3 **The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?**
(Please tick one box on each line)

Activities	Yes, limited a lot	Yes, limited a little	Not limited at all
(a) *Vigorous activities*, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
(b) *Moderate activities*, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
(c) Lifting or carrying groceries	1	2	3
(d) Climbing *several* flights of stairs	1	2	3
(e) Climbing *one* flight of stairs	1	2	3
(f) Bending, kneeling, or stooping	1	2	3
(g) Walking *more than one* kilometre	1	2	3
(h) Walking *several blocks*	1	2	3
(i) Walking *one block*	1	2	3
(j) Bathing or dressing yourself	1	2	3

Q 4 **During the past 4 weeks, how much of the time have you had any of the following problems with your work OR other regular daily activities as a result of your physical health?**
(Please tick one box on each line)

		All of the time	Most of the time	Some of the time	A little of the time	None of the time
(a)	Cut down on the *amount of time* you spent on work or other activities	1	2	3	4	5
(b)	Accomplished less than you would like	1	2	3	4	5
(c)	Were *limited* in the *kind* of work or other activities	1	2	3	4	5
(d)	Had *difficulty* performing the work or other activities (for example, it took *extra* effort)	1	2	3	4	5

Q 5 **During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?**
(Please tick one box)

Not at all	1
Slightly	2
Moderately	3
Quite a bit	4
Extremely	5

Q 6 **How much bodily pain have you had during the past 4 weeks?**
(Please tick one box)

None	1
Very mild	2
Mild	3
Moderate	4
Severe	5
Very severe	6

Q 7 **During the past 4 weeks, how much of the time have you had any of the following problems with your work OR other regular daily activities as a result of any emotional problems (e.g. feeling depressed or anxious)?**
(Please tick one box on each line)

		All of the time	Most of the time	Some of the time	A little of the time	None of the time
(a)	Cut down on the *amount of time* you spent on work or other activities	1	2	3	4	5
(b)	Accomplished less than you would like	1	2	3	4	5
(c)	Didn't do work or other activities as *carefully* as usual	1	2	3	4	5

Q 8 **During the <u>past 4 weeks</u>, how much did <u>pain</u> interfere with your normal work (including both work outside the home and housework)?**
(Please tick <u>one</u> box)

Not at all	1
Slightly	2
Moderately	3
Quite a bit	4
Extremely	5

Q 9 **During the <u>past 4 weeks</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting with friends, relatives etc.)**
(Please tick <u>one</u> box)

All of the time	5
Most of the time	2
Some of the time	3
A little of the time	4
None of the time	5

Q 10 **These questions are about how you feel and how things have been with you <u>during the past 4 weeks</u>. For each question, please give the one answer that is closest to the way you have been feeling. How much of the time during the <u>past 4 weeks</u>...**
(Please tick <u>one</u> box on each line)

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
(a)	**Did you feel full of life?**	1	2	3	4	5	6
(b)	Have you been very nervous?	1	2	3	4	5	6
(c)	**Have you felt so down in the dumps that nothing could cheer you up?**	1	2	3	4	5	6
(d)	Have you felt calm and peaceful?	1	2	3	4	5	6
(e)	**Did you have a lot of energy?**	1	2	3	4	5	6
(f)	Have you felt downhearted and blue?	1	2	3	4	5	6
(g)	**Did you feel worn out?**	1	2	3	4	5	6
(h)	Have you been happy?	1	2	3	4	5	6
(i)	**Did you feel tired?**	1	2	3	4	5	6

Q 11 **How *TRUE* or *FALSE* is <u>each</u> of the following statements for you?**
(Please tick <u>one</u> box on each line)

		Definitely true	Mostly true	Don't know	Mostly false	Definitely false
(a)	**I seem to get sick a little easier than other people**	1	2	3	4	5
(b)	I am as healthy as anybody I know	1	2	3	4	5
(c)	**I expect my health to get worse**	1	2	3	4	5
(d)	My health is excellent	1	2	3	4	5

PHYSICAL ACTIVITY QUESTION

Q 25 **Thinking about all your physical activities (brisk walking, moderate or vigorous) on how many of the LAST 7 DAYS were you active?**
('Active' means doing 15 minutes or more of vigorous activity, <u>OR</u> 30 minutes or more of moderate activity or brisk walking).
(Please tick <u>one</u> box)

0	1	2	3	4	5	6	7
0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days

SOCIAL SUPPORT QUESTIONS

Q 31 **To what extent do you agree that each statement describes your current relationships with other people?**
(Please tick <u>one</u> box on each line)

		Strongly disagree	Disagree	Agree	Strongly agree
(a)	**There are people I can depend on to help me if I really need it.**	1	2	3	4
(b)	I feel that I <u>do not</u> have close personal relationships with other people.	1	2	3	4
(c)	**There is no one I can turn to for guidance in times of stress.**	1	2	3	4
(d)	There are people who depend on me for help.	1	2	3	4
(e)	**There are people who enjoy the same social activities I do.**	1	2	3	4
(f)	Other people do not view me as competent.	1	2	3	4

(g)	I feel personally responsible for the well-being of another person.	1	2	3	4
(h)	I feel part of a group of people who share my attitudes and beliefs.	1	2	3	4
(i)	I do not think other people respect my skills and abilities.	1	2	3	4
(j)	If something went wrong, no one would come to my assistance.	1	2	3	4
(k)	I have close relationships that provide me with a sense of emotional security and well-being.	1	2	3	4
(l)	There is someone I could talk to about important decisions in my life.	1	2	3	4
(m)	I have relationships where my competence and skills are recognized.	1	2	3	4
(n)	There is no one who shares my interests and concerns.	1	2	3	4
(o)	There is no one who really relies on me for their well-being.	1	2	3	4
(p)	There is a trustworthy person I could turn to for advice if I were having problems.	1	2	3	4
(q)	I feel a strong emotional bond with another person.	1	2	3	4
(r)	There is no one I can depend on for aid if I really need it.	1	2	3	4
(s)	There is no one I feel comfortable talking about problems with.	1	2	3	4
(t)	There are people who admire my talents and abilities.	1	2	3	4
(u)	I lack a feeling of intimacy with another person.	1	2	3	4
(v)	There is no one who likes to do the things I do.	1	2	3	4
(w)	There are people I can count on in an emergency.	1	2	3	4
(x)	No one needs me to care for them.	1	2	3	4

RETIREMENT QUESTION

Q 49 **At this time do you consider yourself partly retired, completely retired, or not retired at all?**
(Please tick one box)

Not retired at all	1
Partly retired	2
Completely retired	3

AGE QUESTION

Q 63 **When were you born?**

D	D		M	M	1	9	Y	Y
Day			Month			Year		

GENDER QUESTION

Q 64 **Are you?**
(Please tick one box)

Male	1
Female	2

ETHNICITY QUESTION

Q 66 **Which ethnic group do you belong to?**
(Please tick all the boxes that apply to you)

Pakeha / New Zealander of European descent	1
Māori	1
Samoan	1
Cook Island Māori	1
Tongan	1
Niuean	1
Chinese	1
Indian	1
Other (such as Dutch, Japanese, Tokelauan). Please state below: _____	1

SOCIO ECONOMIC QUESTIONS

Q 82 **For the following questions, please indicate whether or not you have (or have access to) the item by ticking one of the boxes.**

1. **Tick the first box if you have the item or have access to it**
2. **Tick the second box if you don't have the item because you don't want it**
3. **Tick the third box if you don't have the item because of its cost**
4. **Tick the forth box if you don't have the item because of some other reason.**

	Yes I have it	No because	No because	No for some

			I don't want it	of the cost	other reason
(a)	**Telephone**	1	2	3	4
(b)	Washing machine	1	2	3	4
(c)	**Heating available in all main rooms**	1	2	3	4
(d)	A good pair of shoes	1	2	3	4
(e)	**A best outfit for special occasions**	1	2	3	4
(f)	Personal computer	1	2	3	4
(g)	**Home contents insurance**	1	2	3	4
(h)	Enough room for family to stay the night	1	2	3	4

Q 83 **For the following questions, please indicate whether or not you do the activity by ticking <u>one</u> of the boxes.**

		Yes I do it	No because I don't want to	No because of the cost	No for some other reason
(a)	**Give presents to family or friends on birthdays, Christmas or other special occasions.**	1	2	3	4
(b)	Visit the hairdresser at least once every three months	1	2	3	4
(c)	**Have holidays away from home every year**	1	2	3	4
(d)	Have a holiday overseas at least every three years	1	2	3	4
(e)	**Have a night out at least once a month**	1	2	3	4
(f)	Have family or friends over for a meal at least once a month	1	2	3	4

The following questions are about your material standard of living – the things that money can buy (this <u>does not</u> include your health or capacity to enjoy life)**. Tick the answer that best applies to you.**

Q 84

(a) Generally, how would you rate your material standard of living?

High	1
Fairly high	2

Medium	3
Fairly low	4
Low	5

(b) Generally, how satisfied are you with your current material standard of living?

Very satisfied	1
Satisfied	2
Neither satisfied nor dissatisfied	3
Dissatisfied	4
Very dissatisfied	5

How well does your total income meet your everyday needs for such things as accommodation, food, clothing and other necessities?

(c)

My income is not enough	1
My income is *just* enough	2
My income is enough	3
My income is more than enough	4

Q 85 The following are a list of things some people do to help keep costs down. In the last 12 months, how often have you done any of these things? Tick the box that best applies to you.

	Not at all	A little	A lot
(a) Gone without fresh fruit and vegetables to keep down costs	1	2	3
(b) Continued wearing clothing that was worn out because you couldn't afford a replacement	1	2	3
(c) Put off buying clothes for as long as possible to help keep down costs	1	2	3
(d) Stayed in bed longer to save on heating costs	1	2	3
(e) Postponed or put off visits to the doctor to help keep down costs	1	2	3
(f) NOT picked up a prescription to help keep down costs	1	2	3
(g) Spent less on hobbies than you would like to keep down costs	1	2	3
(h) Done without or cut back on trips to the shops or other local places to help keep down costs	1	2	3