THE INFLUENCE OF MEDICATION USE ON ADOPTING HEALTHY LIFESTYLE BEHAVIOURS, AND HEALTH-RELATED QUALITY OF LIFE FOR OLDER ADULTS WITH HEART TROUBLE

A thesis presented in partial fulfilment
of the requirements for the degree of
Master of Science in Health Psychology
at Massey University, Palmerston North,
New Zealand.

Zanisha Mukesh Ramjee

2013

ABSTRACT

Currently, cardiovascular disease is a leading cause of death in New Zealand. The combination of non-modifiable and modifiable risk factors contributes to the disease. Medication can be used to treat modifiable risk factors to slow down the progression of cardiovascular disease. In conjunction with medication, modifiable lifestyle changes such as physical activity, non-smoking, and diet can further discourage the progression of cardiovascular disease. This exploratory study aimed to investigate if medication use influences adopting healthy lifestyle changes, and if health-related quality of life is affected. Using secondary data from the Health, Work, and Retirement Longitudinal study, a total of 406 participants with heart trouble were identified. This sample comprised of males and females aged between 49-72 years old, who completed a questionnaire about their health, work and retirement. The results of the study showed that physical activity was associated with a better quality of life and that medication use did not significantly moderate this relationship. However, significant main effects between medication use and physical activity were observed. The number of days being active decreased as the number of prescribed medications increased. Main effects between non-smoking and medication, and non-smoking and quality of life were non-significant. Cumulatively, there are mixed results of this study compared to some the literature. Due to the nature of the data used, several limitations were identified. Nevertheless, this exploratory study was useful to shed light on the idea that medication use can perhaps influence healthy lifestyle behaviours for older adults, and thus this should be explored further to ensure effective treatment plans for patients with cardiovascular disease.

ACKNOWLEDGEMENTS

I take this opportunity to express my profound gratitude and deep regards to my guide and supervisor Dr. Christine Stephens for her exemplary contribution with knowledge, guidance and monitoring throughout the course of this research project. Without her help this would not have been possible.

Thank you to my friends for their constant encouragement while working on the research. Also thanks to those that proof-read my drafts and final copy. I am grateful for your calm assistance.

Lastly, a heartfelt thank you to my family for their support. Special thanks go to my parents Mukesh and Minakshi Ramjee, and my brother Sheelin for their inspiration, strength and motivation during the duration of my thesis.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION – CARDIOVASCULAR DISEASE AND HEALTHY BEHAVIOUR – AN OVERVIEW

The heart is the most important organ in the entire human body. It functions continuously by expanding and contracting to pump blood to the brain and to vital organs in order to deliver oxygen and other essential substances. If the heart is not looked after well enough it will fail to work efficiently and the body will eventually be deprived of fuel, such as oxygen, causing it to shut down (Selzer, 1992).

Cardiovascular disease (CVD) is the leading cause of death worldwide. It is a broad spectrum of diseases which include coronary heart disease (heart attacks), cerebrovascular disease (stroke), peripheral artery disease, rheumatic heart disease, congenital heart disease and heart failure (World Health Organisation [WHO], 2011a). These diseases involve the heart and blood vessels and typically are a consequence of atherosclerosis. Atherosclerosis is a build-up of fatty deposits called plaque which causes hardening of the artery walls. The narrowing of blood vessels restricts blood flow to the heart and brain and can result in heart attacks and stroke, respectively (Cannon & Vierck, 2009). Heart failure can develop secondary to such events and is associated with a decreased quality of life (QOL) and premature death (O'Neil et al., 2012; Ose et al., 2009). However, CVD is largely preventable through pharmacological interventions and behaviour modification of lifestyle factors. Nevertheless if adherence to medication use and behaviour modification is poor, this can have negative effects on health-related QOL and clinical outcomes (Bosworth, 2010).

Developed regions such as Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, and South Asia are more at risk of CVD (Gaziano, Bitton, Anand, Abrahams-Gessel, & Murphy, 2010). The WHO (2011a) estimates that almost 23.6 million people will die from CVD by the year 2030. In New Zealand, every 90 minutes someone dies from coronary heart disease, which is 16 deaths a day

(Heart Foundation, 2012). These alarming statistics reflect that CVD is a major health issue for the New Zealand population and in fact is a top-ranked priority in the New Zealand health strategy (Ministry of Health, 2012). Consequently, health professionals routinely assess patients for risk of CVD and initiate preventative therapy accordingly.

There are a variety of research designs that are employed to determine how people cope and manage CVD. The vast amount of literature uses quantitative designs, some of which use cross-sectional, longitudinal, or experimental methods, depending on their specific research question (Breakwell, Hammond, Fife-Schaw & Smith, 2006). Regardless of the techniques used, health promoters can use this information to focus on possible risks and proxies that contribute to illness and mortality. For example, it is now known that positive ageing can be promoted by ensuring older adults adhere to being physically active, independent and more productive, which will lead to a healthier lifestyle thus increasing their QOL (Statistics New Zealand, 2009).

Quality of life is multidimensional and domains vary. For this reason, QOL is difficult to measure in a meaningful way (Dunderdalea, Thompson, Miles, Beer & Furze, 2005; Felce & Perry, 1995). A holistic approach to measuring QOL would include “physical impairment and symptoms, functional status (physical and emotional), satisfaction, social functioning (work, leisure, social life, marriage, family, sex, etc), and financial” factors (Mayou & Bryant, 1993). Assessment tools should be based on psychometric properties, and the research purpose (Thompson & Yu, 2003). When QOL is measured in the context of health care, the term health-related QOL is used.

One of the ways to measure health-related QOL is using the SF-36 health survey (Ware et al., 1995). This measure consists of 35 items on QOL and 1 transition question. The SF-36 is useful to assess a CVD patient’s health status, and to monitor disease burden. The survey addresses eight subscales which are organised into two components; physical component summary (PCS) and the mental component summary (MCS). The MCS score represents vitality, social functioning, role-emotional, and mental health. The PCS score represent physical functioning, role-physical, bodily pain, and general health. A higher score for each category indicate a better health-related QOL (Ware et al., 1995). For the purpose of this research, the PCS scores will be of interest as CVD can impact on clinical and physical functioning outcomes.

Throughout this research, the term ‘health-related QOL’ will be used to refer to the PCS component.

It has been widely researched that individuals who have CVD appear to have a decreased physical well-being (Lane, Carroll, Ring, Beever & Lip, 2001). Sullivan et al. (2007) examined the impact of cardiometabolic risk factors (hypertension, diabetes, obesity and hyperlipidemia) on MCS and PCS QOL scores. It was found that cardiometabolic risk factors did not significantly decrease MCS scores. This finding was also consistent with another study (Vathesatogkit et al., 2012) that found diabetes and hypertension negatively influenced PCS scores, but not MCS. Thus CVD appears to significantly decrease physical functioning. Consequently this toxic cycle leads to negative clinical outcomes and mortality. Health-related QOL is especially important for health psychologists to understand how the multidimensional health factors influence health and illness for a person.

Evidence-based best practice guidelines with regard to managing CVD are available through the New Zealand Guidelines Group [NZGG] (2012). These guidelines detail comprehensive information on the assessment process, and lifestyle and pharmacological interventions for cardiovascular risk. Management includes adhering to cardioprotective dietary patterns, physical activity, weight management interventions, and blood pressure and cholesterol lowering medications; all of which leads to improving health-related QOL.

Although the field of health psychology has researched CVD to a large extent, better explanations for behaviours that lead to modifiable risk factors need to be of focus. Research on health promotion should be structured on theoretical frameworks (Crawford & Ball, 2002) to help explain the complexities of the psychology that lies between adhering to healthy behaviours and treatment regimens. The following chapters will justify the purpose of this research. Chapter two introduces the main risk factors that should be addressed to prevent heart trouble. Chapter three outlines ways to manage CVD with regard to adhering to healthy behaviours and mediation use. Lastly chapter four outlines the rationale for the current study.

CHAPTER TWO

RISK FACTORS OF CVD

Risk factors are determinants which increase the chance of an event, such as a heart attack occurring (Cannon & Vierck, 2009). The risk factors for CVD listed in the evidence-based assessment and management guidelines are shown in table 1.

Table 1

Risk factors for cardiovascular disease (NZGG, 2003).

Standard risk factors	Other well-established determinants of CVD risk
Personal history	Atrial fibrillation
Age	Obesity
Sex	Impaired carbohydrate metabolism
Smoking status	Metabolic syndrome
Lipids	Nutrition and dietary patterns
Blood pressure	Physical inactivity
Diabetes	Family history of premature cardiovascular disease
	Socioeconomic position
	Depression, social isolation, and social support

There are two types of risk factors which have shown to be associated with CVD. These are non-modifiable and modifiable risk factors. Non-modifiable risk factors are unchangeable and beyond control of the patient, compared to modifiable risk factors which can be modified, controlled and treated in order to prevent the occurrence of CVD (Cannon & Vierck, 2009). Health psychologists would be interested in modifiable factors as they are able to influence behaviour through psychological interventions.

2.1 Non-modifiable risk factors

Non-modifiable risk factors include increasing age, male gender, menopause, family history and/or race (Cannon & Vierck, 2009). For the purpose of this research, increasing age will be used as an example because the participants are 64 years old on average. It is found that increasing age and CVD are closely related. Aging is a process that has detrimental and damaging effects on the human body. Ageing is generally associated with a redistribution of body fat, increased total abdominal adiposity and fat deposition in skeletal and cardiac muscle, liver, and bone marrow (Kotani et al., 1994; Kyle et al., 2001; Rabkin, 2007). With an increase in fat around the heart, cardiac function and metabolic processes may be impaired because of physical alterations of the blood vessels (Kuk, Saunders, Davidson & Ross, 2009). Consequently, this can impair blood returning to the heart and increase blood pressure, which may eventually lead to heart trouble (Montani et al., 2004). While the process of ageing cannot be intervened, it is important for health promoters and individuals that are at risk to focus on modifiable risk factors to prevent the progression of CVD in the elderly population.

2.2 Modifiable risk factors

Modifiable risk factors which are implicated in the development of CVD include high cholesterol, high blood pressure, diabetes, and cigarette smoking. These factors are especially important as health psychologists would be interested in promoting positive and effective health regimes. Additionally, these factors are of interest because they each reflect the importance of lifestyle changes in prevention of a cardiac event occurrence (Albery & Munafo, 2008; Jensen et al., 2008; WHO, 2011b). The more risk factors present, the higher the risk of a cardiac event. This can include modifiable and non-modifiable factors. For example, being a regular smoker and family health history of heart attack can lead to a higher risk compared to someone who has no hereditary factors and is a smoker.

2.2.1 High cholesterol

As blood cholesterol rises, so does the risk of CVD (Marmot & Elliot, 2005). This is because an increase in cholesterol builds up around the inner walls of the arteries that supply the heart and the brain, causing atherosclerosis, a form of heart disease (see Figure 1). This results in the narrowing of the arteries which then restrict or block the

blood supply to the heart as the build up of plaque hardens and makes the artery less flexible as the muscle becomes stressed. Ultimately, the blood carrying oxygen will not reach the heart and people suffer from chest pain, also known as ‘angina’. If the blood supply is completely cut off by a clot, the muscle will die and this will lead to myocardial infarction (heart attack) or stroke (Marmot & Elliot, 2005).

There are two forms of cholesterol that travel in the blood; low-density lipoprotein (LDL or "bad" cholesterol) and high-density lipoprotein (HDL or "good" cholesterol.) LDL is the main source of plaque which blocks arteries. On the other hand, HDL assists to clear cholesterol from the blood (Cannon & Vierck, 2009). Cholesterol lowering is essential to halt the development of heart disease.

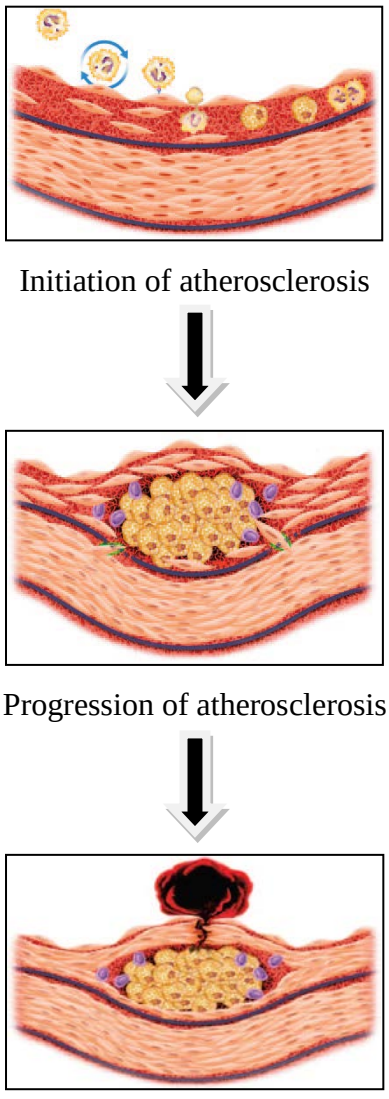

Figure 1. Process of atherosclerosis (Modified from Packard & Libby, 2008).

2.2.2 High blood pressure

The higher the blood pressure, the higher the risk of CVD (Cannon & Vierck, 2009). Hypertension is the medical term used for high blood pressure. Blood pressure can be defined as the pressure of blood on the arterial walls as it circulates through the body (Marmot & Elliot, 2005). When blood leaves the heart via the aorta, blood pressure is at the highest. As the blood enter various arteries, arterioles and capillaries, the pressure decrease. The heart has to work harder to pump against elevated blood pressure. The increase workload for the heart will cause it to enlarge and stiffen, thus decreasing its ability to expand and contract. Ultimately, there will be a decreased output of blood flow to the vital organs (Cannon & Vierck, 2009).

Prevalence statistics report that hypertension is between 45-64% for those aged 65-74 years old (Nicholl & Wilson, 2012). Thus, it is important for older adults to maintain a 'normal' blood pressure range to protect against CVD.

2.2.3 Diabetes

Statistics shows that adults with diabetes have two to four times higher death rates compared to adult who do not have diabetes (Cannon & Vierck, 2009). Diabetes is a chronic condition which involves the body's metabolism. When food is eaten, it gets broken down to a form of sugar called glucose. Since glucose is the main source of fuel for the entire body, a hormone called insulin must allow the glucose to enter cells where it is used for energy. When not enough insulin is produced (Type 1 diabetes), or the body ability to respond to insulin becomes impaired (Type II diabetes) it becomes problematic (Cannon & Vierck, 2009). This is when diabetes develops and lasts throughout life. Since the glucose is not being used it remains in the blood, damaging blood vessels and nerves. High blood glucose levels alter the blood vessel walls as fatty material thickens the lining of the vessels causing clogging. Thus, leading to CVD and death as the circulatory system is being restricted to blood flow causing atherosclerosis and hypertension.

2.2.4 Cigarette smoking

Cigarette smoking results in one in five heart disease deaths (Cannon & Vierck, 2009). This harmful behaviour has a negative impact on nearly every facet of the human

body, which includes the heart, blood vessels, lungs, eyes, mouth, reproductive organs, bones, bladder, and digestive organs (Marks, Murray, Evans & Estacio, 2011). Cigarettes are made of tobacco and harmful chemicals such as nicotine and carbon monoxide.

The nicotine in cigarettes promotes insulin resistance, a pre-diabetic condition that raises blood sugar levels higher than normal. The nicotine also stimulates the body to produce adrenaline, which results in a rise of blood pressure as the heart works harder, producing more heart beats per minute (Marks et al., 2011). Additionally, carbon monoxide decreases the amount of oxygen in the blood. This means that the heart becomes deprived of oxygen. When the heart reaches a critical point of deprivation, it becomes problematic as functionality of organs gets impaired. Furthermore, cigarette smoking also increases a protein called fibrinogen which promotes blood clotting (Cannon & Vierck, 2009). Consequently this leads to a build up of fatty material which narrows the artery causing angina, a heart attack or a stroke. Thus, it is clear that smoking is a critical risk factor to be addressed for patients with heart trouble.

CHAPTER THREE

MANAGEMENT OF CVD

Modifiable risk factors, as previously discussed, can be managed through lifestyle change and medication to improve health-related QOL. The main goal for health professionals is to reduce the 5-year CVD risk to less than 15% (NZGG, 2012). This means that the likelihood of a cardiovascular event over a 5 year period should be less than 15%. The higher the percentage, the more at risk the patient is. A combination of healthy behaviours and medication use can reduce the risk of CVD dramatically for those individuals who are 'categorised' into the above 15% 5-year CVD risk. Each individual is assessed on a case by case basis and treatment plans may need to be modified depending on certain circumstances. For example if high blood cholesterol is due to family history, then lifestyle modifications may not be sufficient to help lower LDL blood cholesterol, so instead prescribed medication will be necessary. Adherence to healthy behaviours and medication use is vital to ensure health-related QOL is not compromised.

3.1 Healthy behaviours

Three main modifiable risk factors will be discussed with regard to managing CVD. The WHO (2011a) recommends healthy behaviours such as non-smoking, engaging in physical activity, and consuming a cardioprotective diet to reduce the chance of a heart attack. In the field of health psychology there has been a vast amount of literature with regard to the benefits and advantages of adhering to the healthy lifestyle recommendations to ultimately improve QOL (Marks et al., 2011).

3.1.1 Non-smoking

Non-smoking should be strongly recommended regardless of the level at risk of CVD. Reducing the number of cigarettes is not a recommended strategy as it does not confer any benefit on cardiovascular health. Conversely, quitting smoking completely has immediate and significant health benefits for all individuals (NZGG, 2012). For example, within the first week of quitting, blood pressure is decreased. Health

professionals are expected to question patients about their smoking status, advise them to stop smoking and provide individualised interventions should they wish to quit (ABC approach).

Following the ABC approach, nicotine replacement therapy such as Habitrol and non-nicotine pharmacotherapies such as Champix (varenicline) can help with smoking cessation, increasing the success rate by two times (NZGG, 2012). These will be beneficial to reduce the process of atherosclerosis. Cells which line the blood vessels and heart will not be damaged at such an accelerated rate, and hypertension will be less problematic as the build-up of plaque will be more controlled (Cannon & Vierck, 2009).

3.1.2 Physical activity

A sedentary lifestyle contributes to the development of an obeseogenic environment. It is advised to engage in 30 minutes of moderate intensity physical activity a day (NZGG, 2012). Small achievable goals are suggested to begin weight control, and then increasing the time to longer durations. Physical activity is beneficial to health in numerous ways. Exercise reduces body fat while preserving lean tissue, increases metabolism which improves the strength of the heart and leads to greater weight loss than dieting alone (Warburton, Nicol & Bredin, 2006). This means that the human body becomes more efficient at storing and using energy during exercise and rest. As a result being active will decrease the tendency of plaque to accumulate around the heart as quickly, thus lowering the likelihood of a cardiac event. Additionally, physical exercise can reduce hypertension, help the body use insulin, and raise HDL cholesterol by increasing cardiovascular system functioning (Cannon & Vierck, 2009).

Only half the population living in New Zealand engage in the recommended 30 minutes of physical activity a day (Ministry of Health, 2012). Social surveys have confirmed the more sedentary lifestyles of modern society. Guo, Courtney and Anderson (2009) were interested to improve QOL including physical health and mental health for older adults, and how to optimise their life potential. A survey involving 730 participants revealed that physical activity was the behaviour least adhered to, compared to consuming a healthy diet and taking their medication as

prescribed. Perhaps consuming a cardioprotective diet and medication is perceived as more desirable options as it does not take up much time. With such worrying statistics it is important for health professionals to promote and encourage physical activity to all age groups.

For the older population, low-moderate intensity activities such as gardening or walking are adequate to prevent CVD if it is consistent over a long period of time (Vogel et al., 2009). This will ensure flexibility and reducing the risk of orthopaedic injury by building healthy bones, muscle and joints, as well as increasing tolerance to stress and depression (Strawbridge, Deleger, Roberts & Kaplan, 2002). Consequently health-related QOL will be enhanced as individuals are more active and independent in their everyday living (Rejeski & Mihalko, 2001).

3.1.3 Cardioprotective diet

A cardioprotective dietary pattern is strongly recommended to all individuals. This involves consuming at least five servings of fruit, vegetables, whole grains, fish, beans, nuts, low-fat milk products, lean meat, and reducing salt intake to less than one teaspoon daily (NZGG, 2012).

Obesity is rare in experimental animals that are maintained on a low-fat diet, even when they are limited to physical activity. In contrast, providing sedentary animals with ad libitum high-fat diets reliably produces increases in energy intake, increases in efficiency of body fat gain, and obesity (Ellis, McDonald & Stern, 1990). This is due to high levels of LDL cholesterol which is positively associated with CVD (Marks et al., 2011). Consuming an unhealthy diet such as eating saturated fat, trans fats and dietary cholesterol heightens these levels which can be detrimental to health outcomes. Instead, a Mediterranean diet is regarded as a good option.

A Mediterranean diet consists of primarily plant-based foods such as fruit and vegetable, legumes and lentils, fish/poultry – more than twice a week, red wine in moderation, meat, and dairy products – replacing butter with Olive oil (Buckland et al., 2009). A meta-analysis (Sofi, Cesari, Abbate, Gensini & Casini, 2008) reviewed adherence to a Mediterranean diet and incidence/mortality of chronic diseases, such as

CVD, cancer, Parkinson's disease and Alzheimer's disease. The researchers concluded that good adherence to this healthy diet will improve health status and reduce mortality rates dramatically for the chronic diseases mentioned above. Thus, guidelines and recommendations such as this ensure that CVD prevention is maximised as LDL cholesterol levels are lowered through lifestyle intervention to potentially increase QOL.

3.1.4 Problems with healthy behaviours

Despite being educated about the facts that non-smoking, 30 minutes of physical activity a day and a healthy diet is beneficial to prevent CVD, a large proportion of individuals do not adhere to healthy behaviour recommendations (Martin, Haskard-Zolnierek & DiMatteo, 2010). This is problematic given the numerous benefits of adhering to healthy lifestyle intervention. Caterson et al. (2012) suggests that reduction of body weight maintained over six weeks (short-term) or one year (long term) produce desirable results. Benefits include reduction in risk of developing heart disease, reduction in risk factors for Type II diabetes, improvements in blood glucose and triglycerides, improved physical performance, lowers blood pressure, reduces cholesterol, and improved health-related QOL.

Reasons for patient non-adherence to healthy lifestyle are complex because there are numerous internal and external factors that influence behaviour. A study (Prapavessis et al., 2005) used the theory of planned behaviour to aid in understanding the reasons for non-adherence to physical activity in the issue of CVD. Using subjective questionnaires, the results suggest that subjective norm and perceived behavioural control were the key determinants to drive intention to exercise for congenital heart disease patients. While Prapavessis and colleagues' (2005) study appears to have limitations such as maturation effects and using self-report questionnaires, this study does appear as preliminary to shed light on CVD adult patients' beliefs towards physical activity and secondly to determine whether this theoretical approach might explain their physical activity behaviour. In saying that, the CVD patients are most likely to be taking medication and this may have well influenced their beliefs about adopting healthy behavioural changes (attitude, subjective norm and perceived behavioural control); a factor which was not addressed.

Furthermore, it is evident that non-adherence to healthy behaviour is influenced by many other factors. Refraining from unhealthy habits does not usually occur suddenly but rather is a process of many stages. The Transtheoretical Model (Prochaska & DiClemente, 1983) describes five stages which involve a dynamic process where individuals progress through when changing their behaviour in the desired direction. Previous research that employed the Transtheoretical Model has documented that willingness to reduce dietary fat intake, as well as readiness to consume a healthier diet (more fruit and vegetables), were associated with eagerness to engage in physical activity (Boyle, O'Connor, Pronk, & Tan, 1998). Moreover, critics have argued that behaviour change is not necessarily reflected in the differences in processes between the stages, instead it is more likely to be about the same processes varying across the whole change-related span (Rosen, 2000, as cited in Albery & Mufano, 2008). This means that there are various influences on adopting healthy lifestyle behaviours that are inter-related and complex.

Engaging in exercise, smoking cessation, taking medication, seeking help, making and keeping appointments with health professionals, are specific behaviours which locus of control is pertinent (Wallston & Wallston, 1978). Several studies have indicated that high internal locus of control individuals are more likely to change their behaviour to a greater extent to facilitate their well-being (Marks et al., 2011; Schneider et al., 2006).

3.2 Medication Use

Drug therapy has been widely accepted in the management of CVD and initiated after lifestyle intervention has failed (NZGG, 2012). Drug therapy is based on a 5-year CVD risk spectrum. Generally the more risk factors, the more medication is needed. For example for hypertension Drug A will be prescribed, for diabetes Drug B will be needed. Consequently, this has implications for overall health outcomes.

Prescribed medication use among CVD patients show that the risk of a cardiac event can be decreased if risk factors are adequately addressed. Statins are drugs that can reduce cholesterol. They assist by helping the body reabsorb plaque that accumulates around blocked vessels (Maron, Fazio & Linton, 2000). When recommended lifestyle

behaviours do not lower LDL cholesterol to a desirable level, statins become beneficial to actively speed up the process to reduce cholesterol. Consequently this will slow the progression of the disease. Additionally, angiotensin converting enzyme (ACE) inhibitors reduce blood pressure by dilating blood vessels to improve blood flow to and from the heart (O'Rourke, 1990). As a result this can improve shortness of breath, improve the ability to perform daily activities, thus enhancing health-related QOL.

3.2.1 Problems with medication use

Although medication adherence has been a topic of discussion in the health psychology field for many years, the extent of poor adherence is still concerning (Bosworth, 2010). There is a limited amount of research that focus on whether or not individuals who do not adhere to medication regimens engage in lifestyle changes. If future research considers this, this may lead to a considerable decrease in morbidity and mortality for those who have CVD.

Decision-making about treatment plans can become complicating especially for older adults who have multiple conditions. In the year 2002, the United States of America statistics reported that 60% of over 65 year old adults take a minimum of five medications, and approximately 12% use at least 10 different medications (Kaufman, Kelly, Rosenberg, Anderson & Mitchell, 2002). The high number of medication can produce side-effects, some of which are serious and some which are less concerning (Bosworth, 2010). This may lead to non-adherence and consequently ineffective rehabilitation.

If a patient has a good understanding and knowledge of the reason why they are taking their medication, they are more likely to adhere to the treatment plan. Christensen and colleagues (2010) investigated the extent to which patient and physician attitudes with regard to locus of control were correlated with medication adherence. In total, 456 patients with co-morbid diabetes and hypertension were recruited to participate in the study. The results suggest that physician-patient dyads whereby beliefs of internal locus of control were similar indicated higher medication adherence compared to dyads in which patients held a lower internal locus of control belief than their physicians. This suggests that a mutual understanding between health professionals

and patients is necessary to ensure a balanced awareness and knowledge of why the medication is beneficial, and why is has to be taken as instructed. The perceived benefit and value that individuals place on expected outcomes becomes a relevant factor to adherence to medication due to cognitive processes which help direct their behaviour.

Overall, it is clear that there is limited research to illustrate that the studies of healthy behavioural change do not consider the role of medication use in patients with CVD.

3.3 Influence of medication on adopting healthy behaviours

An exploratory study revealed that patients with coronary heart disease perceived medication to be more effective over healthy behaviours (Speechly, Bridges-Webb, McKenzie, Zurynski & Lucas, 2010). Such finding may be explained by one of the constructs in the Health Belief Model (Rosenstock, Strecher & Becker, 1988); that is perceived barriers.

The Health Belief Model is a social cognition model that involves an individual's opinion about their disease or illness i.e. heart trouble. The severity, susceptibility of the illness, benefits to prevention, and barriers to taking action mark the four critical areas of one's perception (Rosenstock, Strecher & Becker, 1988). With regard to CVD, medication appears to be an obstacle, discouraging people to adopt healthy behaviours. Perhaps medication was seen as more "superior" than non-smoking, exercising and maintaining a healthy diet. This is reflective in Speechly and colleagues' (2010) study in which patients had assessed taking medication as being far easier than the more effortful nature of engaging in healthy behaviours. Current medical opinion suggests that medication in conjunction with healthy behaviours will lead to improved health-related QOL (NZGG, 2012).

CHAPTER FOUR

RATIONALE FOR CURRENT RESEARCH

4.1 Overview

According to NZGG (2012), there is clear evidence that non-smoking and physical activity are associated with improved clinical outcomes, i.e. with respect to blood pressure, cholesterol, and blood sugar in patients with CVD risk. This is important because clinical outcomes are predictors of morbidity and mortality rates. Those with a moderate to severe CVD risk require medication but they are still encouraged to engage in healthy lifestyle behaviours as this combination is superior at improving clinical outcomes than either intervention used alone. However, if medication influences adopting healthy lifestyle behaviours then clinical outcomes would subsequently be affected.

While different avenues of CVD progression have been researched to a great extent, there is a very limited amount of research on whether or not medication influences adopting healthy lifestyle changes. The idea that perhaps once medication is prescribed, patients may consider healthy behaviour recommendations as insignificant and not take on health care professional's advice becomes a problem. This may be due to several inter-related reasons. The non-adherence to healthy lifestyle factors may necessitate increased doses of medication and subsequently increased side effects, especially for older adults. This can then result in medication non-compliance and ultimately the patient's clinical outcomes and QOL are not optimised.

4.2 Research questions

The main exploratory research question that arises from the gap in this background is: Does medication use influence adopting healthy lifestyle changes and whether this will subsequently affect health-related QOL for older adults with heart trouble.

Four focussed questions were specified:

1 Does medication use moderate the relationship between healthy behaviours (non-smoking and physical activity) and health-related QOL?

2 Are healthy behaviours (non-smoking and physical activity) related to medication use?

3 Are healthy behaviours (non-smoking and physical activity) related to health-related QOL?

4 Is medication use related to health-related QOL?

The outcomes related to research question one would not exclude any possibility that medication has an effect on adopting healthy behaviours. It is therefore important to look at the direct effect of medication on healthy behaviours. That is, does medication use discourage non-smoking and physical activity? Regardless of health-related QOL, if a relationship between healthy behaviours and medication use does exist then clinical outcomes would be affected. Health-related QOL will be used as a measure of the outcome of medication use and adoption of healthy behaviours. Furthermore, the finding of the relationship between medication use and health-related QOL will determine the effect of having heart trouble for older adults.

CHAPTER FIVE

METHOD

5.1 Study Design

The current study is a secondary analysis of the Health, Work, and Retirement (HWR) Longitudinal study that began in 2006. The study aims to identify the influences on health and well-being in later midlife to early old age (Alpass, Towers, Stephens, Davey, Fitzgerald & Stevenson, 2007). Each wave of surveying has been and will be carried out every two years. Participants were randomly selected from the New Zealand electoral roll to ensure a representative sample of New Zealanders. Individuals in institutions such as nursing homes, prison and dependent care were excluded from the study. In 2006, an overall response rate of 53% resulted in a base sample of 6,662 individuals that completed the first postal questionnaire survey. A total of 2,493 participants of the second wave in 2008 agreed to participate. Missing data which could not be estimated were removed; leaving a final sample size of 2,282. The sample for the present study was drawn from participants in the second wave.

5.2 Participants

Purposive sampling was used for this research. Diagnosed illness was assessed using one item from the 2008 HWR questionnaire: “The following questions focus on health problems you may have. Please tick the box(s) marked ‘Yes’ to indicate if a doctor, nurse or other heath care worker has told you that you have any of the following health problems. Please also indicate the year in which each health problem (if applicable) was diagnosed”. In total, 406 participants ticked “Heart trouble” (e.g., angina or myocardial infarction). These cases were extracted from the dataset for analysis. The remaining cases were deleted.

The sample consisted of 56% male and 44% females, aged between 49-72 years old (M = 64.02, SD = 5.76) of whom 51% Māori, 47% New Zealand European/other, 2% Pacific, and 1% Asian. Table 2 displays the characteristics of the participants with heart trouble.

Table 2

Characteristics of participants in the study (n = 406)

	n	**%**
Age years		
55-60	110	27.2
61-65	120	29.6
66-70	129	31.9
71-75	46	11.4
Gender		
Male	230	56.7
Female	176	43.3
Ethnicity		
NZ European/other	191	47.0
Māori	207	51.0
Pacific	7	1.7
Asian	1	2.0

5.3 Ethics

Ethical approval for the HWR Longitudinal study procedures was gained from the Human Ethics Committee at Massey University, New Zealand (HEC: ON 05/90) prior to commencing the study. For further information with regard to the methodology and sample selection see http://hwr.massey.ac.nz/resources/methodology_towers.pdf

For the current research, a Massey University student contract was signed to acknowledge and accept the terms and conditions of the use of the HWR survey database.

5.4 Measures

Demographic information questions were modelled from the 2001 New Zealand Census of Population and Dwellings (Statistics New Zealand, 2001).

5.4.1 Control Variables

Age, gender and economic living standards were used as control variables for research question one. Date of birth was requested to determine Age. Gender was an observed dichotomous variable (1 = Male, and 2 = Female). The New Zealand Economic Living Standards Indicator (ELSI) assessed restrictions in ownership of assets (8 items), restrictions due to cost in social participation (6 items), the extent to which respondents economise (8 items), and a self-rated indicator of standard of living (3 items). A combined score ranging from 0 to 31 was formed. Higher scores indicated higher economic living standards. The scores were categories into five subscales (1 = severe hardship, 2 = significant hardship, 3 = some hardship, 4 = fairly comfortable, 5 = comfortable, 6 = good, 7 = very good). Cronbach's alpha coefficient for ELSI was acceptable ($\alpha = 0.81$).

5.4.2 Quality of life

Quality of life was assessed using the SF-36 Version 2 questionnaire which is a health-related QOL measure (Ware et al., 1995). The PCS sub-scales include physical functioning (10 items, $\alpha = 0.93$), role-physical (4 items, $\alpha = 0.84$), bodily pain (2 items, $\alpha = 0.82$), and general health (5 items, $\alpha = 0.78$). Cronbach's alpha coefficient for the category PCS was acceptable ($\alpha = 0.92$). All questions were scored on a scale from 0 to 100, with 100 representing the highest level of functioning. All scores were weighted so that they may be interpreted in the same direction (i.e., higher scores mean better health-related QOL). The averaged scores for each question were then compiled for a final score for each sub-scale to provide the PCS score (Ware et al., 1995). The PCS score ($M = 42.61$, $SD = 10.97$) will be used to determine the physical component of QOL.

5.4.3 Healthy Behaviours

a) Non-smoking

i) Smoking status

Smoking status was assessed using one item that was adapted from The Quit Group (The Quit Group, 2012): "Would you currently consider yourself a regular tobacco smoker?" Participants responded by ticking the "Yes" or "No" box. Smoking status was scored as 1 = Yes, and 2 = No.

b) Physical activity

i) Number of days being active

The continuous variable of physical activity was based on the New Zealand Sport and Physical Activity surveys (Sport and Recreation New Zealand, n.d.). Physical activity was assessed using one item: "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, OR 30 minutes of more of moderate activity or brisk walking)". Responses were ticked in boxes which ranged from 0 days to 7 days.

ii) Physical Activity Level (PAL)

The categorical variable of PAL was based on the variable 'number of days being active' (Sport and Recreation New Zealand, n.d.). Number of days being active in a week was divided into two groups; 0-3 days – 'low PAL', and 4-7 days – 'high PAL'. Physical activity level of each participant was scored as 1 = Low, and 2 = High.

5.4.4 Medication

i) Number of prescribed drugs

The continuous variable of prescription drug use was assessed using one item: "Please indicate how many prescription drugs you are currently taking". Responses were numerical (M = 5.29, SD = 3.47).

ii) Medication use

The categorical variable of medication use was based on the variable 'number of prescribed drugs'. Number of prescribed drugs was divided into two groups: low medication use (0-5 prescription drugs), and high medication use (5+ prescription drugs). Medication use of each participant was scored as 1 = Low medication use, and 2 = High medication use.

5.5 Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 19.0 was used for all data analyses.

5.5.1 Data Management

Initially, results were screened for errors in data entry. Since more than 5% of the medication use values were missing, these values needed to be dealt with to reduce the occurrence of misleading results by introducing bias (Tabachnick & Fidell, 2007). The chosen technique used to deal with missing data was pairwise deletion. In SPSS, pairwise deletion removed only the specific values from the analysis, not the entire case. All analyses were conducted using an alpha of .05.

5.5.2 Research question testing

Firstly, a 2 x 2 x 2 Analysis of Covariance (ANCOVA) was carried out to determine if medication use moderated the relationship between healthy behaviours (non-smoking and PAL) and health-related QOL. Secondly, chi-square testing was used to determine if there is a relationship between healthy behaviours (non-smoking and PAL) and the variable of medication use. A follow-up Pearson's correlation coefficient was conducted describe the strength and direction of the bivariate association between number of days being active in a week and the number of prescribed drugs. Furthermore, Pearson correlation coefficient was useful to describe the nature of the relationship between the number of prescribed drugs and health-related QOL. Details of the results are outlined in Chapter six.

CHAPTER SIX

RESULTS

6.1 Research Question One

Does medication use moderate the relationship between healthy behaviours (non-smoking and physical activity) and health-related QOL?

To test the prediction that medication use will moderate the relationship between the healthy behaviours and QOL, a 2 (smoking status: yes or no) x 2 (PAL: low or high) x 2 (medication use: low or high) ANCOVA was employed while controlling for ELSI, gender and age. The null hypotheses tested that there was no significant difference between the groups of smoking status, PAL, and medication use on the QOL score. Before interpreting the results of the ANCOVA, data screening and a number of assumptions were tested.

The assumption of each observation being independent of another was met via random selection. This assumption was also confirmed by review of a scatterplot of residuals against the levels of the independent variables. The level of measurement of the dependent measure (health-related QOL) is assumed to be at least an interval scale; ordered, having an equal distance between points on the scale, and no natural zero point (Nunnally & Bernstein, 1994). This indicates that it is suitable as it fits with the assumptions of ANCOVA testing. The distribution of normality of each variable used, using the Kolmogrov-Smirnov test (KS) was conducted. The KS test assesses the kurtosis and skewness of the data. If the absolute value of the statistic is more than two times the standard error then it is too large (Howell, 2004). If the normality assumption is violated then a less sensitive ‘rule of thumb’ is used, using histograms (Antonisamy, Christopher & Samuel, 2010). According to the Central Limit Theorem a large sample size ($n > 30$) will approximate normality (Howell, 2004). If a significant difference in a normally distributed sample was evident ($p < .05$) then reference to the less conservative test of histograms was used to assess normality. Appendix A illustrates a summary table of assumption testing for each level of each independent variable. In

general, there is evidence that normality has been met. Overall, all assumptions were met for acceptable use of the ANCOVA test.

Using a 2 x 2 x 2 ANCOVA, the results showed that there was a significant main effect of PAL ($F_{(1,212)} = 4.15$, $p < .05$), with larger differences between QOL and high PAL ($M = 45.49$) than between QOL and low PAL ($M = 38.81$; i.e., high PAL is associated with higher QOL scores). Additionally, there was a significant main effect of medication use ($F_{(1,212)} = 6.16$, $p < .05$) on health-related QOL scores for older adults with heart trouble. There was larger differences between QOL and low medication use ($M = 45.70$), than between QOL and high medication use ($M = 38.56$; i.e., low medication use is related to higher QOL scores). There was no main effect of smoking status on health-related QOL ($p > .05$).

Furthermore, the results demonstrate that there is a no significant interaction effect on QOL scores ($p > .05$). For this reason simple effects were not performed on any interaction effects. It is critical that the analysis revealed only main effects for PAL and medication use, but no interactions. The results described above suggested that there was no influence of medication use on the relationship between healthy behaviours and health-related QOL.

6.2 Research Question Two

Are healthy behaviours (non-smoking and physical activity) related to medication use?

Two chi-square tests for independence were performed. The first chi-square test was conducted to determine if there was a relationship between smoking status and medication use. The second chi-square test was carried out to to determine if there is a relationship between PAL and medication use. Prior to interpreting the results of the chi-square tests, two assumptions were evaluated. The first requirement for chi-square is that 80% of the cells have expected frequencies greater than 5. Secondly, the assumption that observations are independent of each other is required (Walker & Maddan, 2012). Both assumptions were met for acceptable use for each test.

As depicted on Table 3, there is a non-significant relationship between smoking status and medication use. Thus, the null hypothesis that there is no association between smoking status and medication use was accepted. This means that people who take medication (whether it is high or low usage) are not more or less likely to be smokers. On the other hand, there is a significant relationship between PAL and medication use for older adults with heart trouble. Thus, the null hypothesis that there is no association between PAL and medication use was rejected.

Table 3

Chi-square statistic with two degrees of freedom ($X^2_{(2)}$) between healthy behaviours and medication use

Healthy Behaviour	Medication use
Smoking status	1.85
Physical activity level	17.82*

*$p < .001$

A follow-up Pearson correlation coefficient was conducted to describe the strength and direction of the relationship between PAL and medication use. For this reason the continuous variables of number of days being active and number of prescribed drugs were used. The null hypothesis was that the relationship would be 0. Before running the analysis, several assumptions were evaluated (Allen & Bennett, 2008; Greenfield, Kuhn & Wojtys, 1998). The assumption of each observation being independent of another was met via random selection. Additionally, the level of measurement is assumed to be at least an interval scale (Nunnally & Bernstein, 1994). This indicates that it is suitable as it fits with the assumptions of correlation testing. The assumptions of the distribution of normality of each variable were tested. The data for the variables named, number of prescribed drugs, and number of days being active showed a significant difference in a normally distributed sample ($p < .001$); therefore both variables failed the KS testing. As a result, reference to the less conservative test of histograms was used to assess normality. The histogram gave some indication that the sample of number of prescribed drugs was positively skewed but it is not severe. The histogram illustrated a fairly normal distributed sample for number of days being active. As a result both variables were suitable for the assumption of normality. Lastly,

an inspection of the scatter plot of standardised residuals against standardised predicted values indicated the assumptions of linearity and homoscedasticity of residuals were met.

The Pearson correlation coefficient found that there was a significant weak negative relationship between the number of prescribed drugs, and the number of days being active (r = -.29, p < .001). Thus, the null hypothesis that the correlation is 0 was rejected. These results indicate greater number of prescribed drugs is associated with lower number of days being active; vice versa, for older adults with heart trouble.

6.3 Research Question Three

Are healthy behaviours (non-smoking and physical exercise) related to health-related QOL?

Given the non-significant main effect of smoking status and health-related QOL in research question one it was not necessary to explore this relationship further. However, the significant main effect between PAL and QOL required further analysis. A Pearson correlation coefficient was calculated to describe the strength and direction of the relationship between number of days being active and health-related QOL. The null hypothesis was that the relationship would be 0. Assumption testing for normality demonstrated that the QOL scores showed a significant difference in a normally distributed sample (p < .001); i.e. failed the KS test. However, the histogram plot illustrates that the QOL scores were fairly normally distributed. The assumptions of linearity and homoscedasticity of residuals were met.

Table 4

Bivariate correlations (Pearson's r) between healthy behaviours and QOL

Healthy Behaviour	QOL
Smoking status	N/A
Number of days being active	.49*

Note. N/A stands for not applicable.
*p < .001

As can be seen from Table 4, a statistically positive relationship existed between QOL and the number of days being active. This indicates that people with better QOL, are more active, and vice versa. Thus, the null hypothesis that the correlation is 0 was not accepted. This means that the number of days active does relate to health-related QOL.

6.4 Research Question Four

Is medication use related to health-related QOL?

Pearson correlation coefficient was performed to describe the strength and direction of the relationship between the continuous variables of the number of prescribed drugs and health-related QOL scores. The null hypothesis was that the relationship would be 0. All assumptions with regard to Pearson correlation coefficient, mentioned in 6.2 were met for both the variables.

There is a significant negative moderate relationship between number of prescribed drugs and QOL scores (r = -.46, p < .001). Thus, the null hypothesis that the correlation is 0 was rejected. This indicates that greater health-related QOL is associated with lower number of prescribed drugs, and vice versa.

CHAPTER SEVEN

DISCUSSION

7.1 Summary of results

This exploratory study aimed to investigate whether medication influences adherence to healthy lifestyle behaviours and whether this will subsequently affect health-related QOL for older adults with heart trouble. The results of the present study demonstrate that physical activity was related to a better QOL and that medication use did not significantly moderate this relationship for CVD patients. However, significant main effects between medication use and QOL, and PAL and QOL were observed. The number of prescribed drugs decreased as the number of days being active increased. Main effects between smoking status and QOL, and smoking status and medication use were non-significant. Cumulatively, there are mixed results which need explaining.

7.2 Research Question One

It is evident that medication use does not moderate the relationship between healthy behaviours and health-related QOL. Health-related QOL was used to assess the effect of medication use and adoption of healthy behaviours. While medication use positively moderates the relationship between healthy behaviours and clinical outcomes (NZGG, 2012), the same cannot be said with respect to health-related QOL. This study showed physical activity was associated with an increase in QOL, but medication use had no significant effect in moderating this relationship. While medication may produce clinical improvements, it does not necessarily translate into improved health-related QOL.

Several possibilities may help to explain the non-significant interaction effect of medication use on health behaviours and QOL. The non-significant effect may have been due to the subjective nature of QOL (Dunderdalea et al., 2005). The experience of having heart trouble is different for each person. Perhaps taking medication made some people feel positive about their condition, as they feel that they are in control. On the other hand, others may feel that taking medication stigmatizes them as “ill” or as a

"patient" (Marks et al., 2011). Thus, various experiences of having heart trouble can affect feelings, perceptions, pain and functioning; all of which can either increase or decreases one's sense of QOL.

Another important issue that this finding highlights is non-adherence to medication. Perhaps the patients in this study were not even adhering to medication therefore whether or not it is a moderating factor is difficult determine. By not measuring adherence to medication becomes an important limitation to mention for this study. Patients frequently do not adhere to medication regimens due to biological and psychological factors or interacting effects of the two (Bosworth, 2010). Although the recognition of the importance of medication adherence has been increasing, there are some factors which are non-modifiable or difficult to change. For example, disease characteristics and treatment factors are associated to non-adherence (Bosworth, 2010). This includes the severity of the disease and visibility of symptoms.

A further explanation of a non-significant effect may be due to the asymptomatic nature of some CVD risk factors such as hypertension and high cholesterol. Numerous studies have found that patients who have asymptomatic chronic illnesses, such as those with hypertension, diabetes, and high cholesterol are associated with higher rates of medication non-adherence, compared to individuals who have more obvious symptoms (Miller, 1997). Perhaps individuals do not want to be embarrassed or perceived as "ill" due to their visibility of symptoms. Thus, they adhere to their treatment plan more closely. CVD patients in particular, are on medication that does not produce a noticeable effect but largely serves as a preventative purpose (Selzer, 1992). These patients often are less likely to adhere because they do not understand the preventative role of their medication. Thus, future research should measure non-adherence to medication as this is an important topic for health psychologists. This information will be useful to devise interventions for promoting medication adherence.

Furthermore, research question one showed a non-significant main effect of smoking status on health-related QOL for older adults with CVD. Due to the clinical outcomes of smoking, is it evident that this undesirable behaviour can influence QOL. In a study by Strine et al. (2005) it was found that smoking had a negative impact on health-related QOL. This was primarily due to decreased physical functioning. Another study

assessed the influence of long-term smoking reduction on health risk markers and general health status (Bolliger et al., 2002). It was found that individuals who did not reduce smoking at a significant level showed lower general health scores compared to people who did stop smoking. This was not evident with the CVD participants in the current study. This emphasises the subjective nature of QOL (Dunderdalea et al., 2005). The individuals' experience of his or her situation depends on the context particular to them. For example smoking may be perceived as a positive behaviour for some, despite the risk factors and negative clinical outcomes that are associated with it.

While there is a well-established biological link between smoking and the reward pathway in the brain (Kozlowski, Henningfield & Brigham, 2001) health psychology has not attempted to extensively research whether smoking is related to positive affect which essentially can lead to an increased health-related QOL. Nicotine consumption increases the levels of dopamine in the central nervous system that are responsible for euphoria and relaxation via the reward pathway (Kozlowski, Henningfield & Brigham, 2001). Thus, smoking does appear to increase positive emotions by using a form of distraction of pain as feelings of controllability and satisfaction are experienced. While this may be an explanation for an increase in QOL, it is emphasised that clinical outcomes in particular, CVD risk is disproportionate amongst smokers.

Furthermore, smoking cessation may be associated with an increased QOL for some individuals with CVD. A study by Bolliger and colleagues (2002) examined the influence of long-term smoking reduction on health risk markers. After two years, successful reducers showed a significantly greater decrease in cotinine levels, cholesterol/high-density lipoprotein ratios, haemoglobin concentrations, pulse rate and significantly improved general health score. This illustrates those individuals with CVD who stop smoking, experience greater levels of health-related QOL. Overall the explanations mentioned above are plausible for this current study. Hence there being multiple effects of smoking on QOL, resulting in no clear relationship.

Cumulatively, the findings of research question one suggest that it is unclear if medication use has an effect on the relationship between adopting healthy behaviours and health-related QOL. For this reason, the main effect of medication and smoking status, and medication and physical activity needs to be explored further.

7.3 Research Question Two

It appears that the relationship between healthy behaviours and medication use is related to the nature of the behaviour itself. There was a significant relationship between medication use and PAL but not for smoking status in older adults with heart trouble.

7.3.1 Smoking status and medication use

According to NZGG (2012), cutting down on the number of cigarettes is of little health benefit due to smoking fewer cigarettes more intensively hence cessation is desirable. Clinical outcomes are immediate after quitting smoking. Even within the first few days oxygen delivery to the body is improved and the person feels more energized (Martin et al., 2010).

Unfortunately a measure of past smoking was not used for this study. Future research should use such a measure to gain information about whether people had recently given up or were never smokers. In the present study, smoking status (being a regular smoker or not) was used to give an indication of whether medication use would have any effect on adopting the healthy behaviour of non-smoking. There was a non-significant relationship between smoking status and medication use. This means that CVD patients on a low medication use were smoking in similar quantities to those with high medication use.

It is expected for medication use to be less influential on smoking cessation than physical activity due to the addictive nature of the former (DeVane, 2006). CVD risk patients who are regular smokers find it difficult to quit compared to starting to engage in some level of physical activity (DeVane, 2006). However, the multitude of factors associated with smoking must be taken into account. For example stress where smoking becomes a coping mechanism as a person feels more in control of the stressor. Future research should include the mental component of QOL as well. In this way, emotion and mood will be taken into consideration to allow for a holistic approach in exploring QOL.

7.3.2. Physical activity and medication use

Physical activity has shown to decrease the CVD risk of a patient. It may do this by helping to reduce blood pressure in hypertensive patients (Marmot & Elliot, 2005). Initially, it was found that PAL was related to medication use. That is, the higher the level of physical activity, the lower the medication use. To explore this relationship further, a correlation analysis measured the number of prescribed medication measured against the number of days being active for each participant with CVD. The results show that older adults who were on fewer prescribed drugs were more frequently active. The outcomes of this research question would have been more accurate had there been a larger sample size of people who did not take any medication at all. The small sample size of 12 participants who did not have any prescribed medication did not allow for a feasible analysis.

The finding that there is a significant relationship between number of days being active and number of prescribed drugs corroborates those of Stessman, Hammerman-Rozenberg, Ein-Mor & Jacobs (2009) who used information from the Jerusalem Longitudinal Cohort Study. The results concluded that physically active participants, who were aged above 70, took fewer medications compared to those who were less active. Additionally, it was discussed that physically active participants reported fewer falls or fractures and less chronic joint or musculoskeletal pain. Exercise does not only reduce the risk of CVD, but also slows down the progression of other conditions such as arthritis (Marmot & Elliot, 2005). The most common type of arthritis among older adults is osteoporosis. Osteoporosis is the general wearing down of cartilage leading to joint damage, pain and stiffness which ultimately impacts joint mobility (Lane, 2006). Thus, it is not surprising that being more active is associated with lower number of medication given the vast amount of research that shows that a higher uptake of health-enhancing physical activity has numerous health benefits, for both the young and old (Marmot & Elliot, 2005, NZGG, 2012; Selzer, 1992).

The results of Stamatakis, Hamer, & Primatesta (2009) confirm the present findings with regard to physical activity and medication for those with CVD. Stamatakis and colleagues (2009) aimed to establish PAL in relation to cardiovascular medication and to examine if physical activity is related with benefit independently of medication

among people with no diagnosis of CVD. This study included respondents of the 1998 and 2003 Scottish Health Survey and the Health Survey for England. The results show that higher levels of physical activity are linked with lower cardiovascular medication. Therefore being physically active means less health problems and less prescribed medication. Overall healthy behaviours are important especially for those at low/moderate risk because their CVD risk may initially be reduced by engaging in healthy lifestyle behaviours alone (NZGG, 2012).

On the other hand, it may be possible that the higher the number of prescribed drugs is related to lower number of days being active because cognitive interpretation of medication may be influencing this result. Perhaps patients with CVD think that medication will be sufficient alone to improve health outcomes, rather than engaging in lifestyle changes as well. Speechly et al. (2010) explored patients' and general practitioners' perceptions about the effectiveness of healthy behaviours and medications for the prevention of further CVD. Eight general practitioners and 13 or their patients with CVD were interviewed to gain qualitative data. The themes that emerged from the semi-structured interviews were: specific improvements in cardiovascular health were attributed to medications, healthy behaviours were perceived to require too much effort, social connections facilitated adherence to healthy behaviours, general practitioners were realistic about patient adherence, and general practitioners took a patient-centered approach to lifestyle behaviour change. A participants' attitude with regard to lifestyle changes emphasised the explanation that cognitive interpretations of medication can influence adherence to medication use. The participant reported saying, 'If you're essentially hypertensive I don't think lifestyle changes are going to help it dramatically. I think you do need medication for it'. If individuals hold negative perceptions of lifestyle change (such as healthy behaviours being time consuming, compared to just taking a tablet), this becomes worrying. Speechly and colleagues (2010) also noted that patients perceived that taking a tablet was an easy and straightforward act aided by 'routine' or 'habit', whereas adherence to healthy behaviours required more physical and mental effort.

It is important to note that the relationship between the healthy behaviours and medication use is bi-directional so it is difficult to tell if medication use is influencing the inclination to engage in health behaviours as suggested. It is equally likely that

people are taking more medication because they are less healthy and are accordingly unable to engage in physical activity.

For older adults the potential of having more side effects due to high medication use means that they are unable to engage in exercise without fear of pain. Even though medication is prescribed, medication adherence may be poor if side effects are disruptive to one's everyday tasks or cause discomfort. For example statins which help to lower the risk factor of cholesterol causes muscle tenderness or aches and pains (Maron et al., 2000). This well-established side effect of statins can reduce physical activity. The higher the dose, the more likely one will experience these problems. ACE-inhibitors which lower blood pressure can cause dizziness or light-headedness and also discourage exercise (O'Rourke, 1990). Side effects such as these may create barriers towards adopting lifestyle change. Ultimately it does not mean that low medication use leads to automatically being physically active.

The present findings of research question two demonstrate that medication had influenced the adoption of engaging in physical activity for CVD patients. Initially Speechly et al. (2010) proposed that there was a perception of medication being more superior to lifestyle changes but there may also be physical implications of the medication that influences the ability to exercise. For example the side effects as previously mentioned or the severity of illness related to more medication use. Establishing a relationship between smoking status, and medication use is far more complex due to the numerous factors involved. The components of social, psychological, and environmental factors have to be taken into account when explaining health and behaviour, which will consequently affect health-related QOL.

7.4 Research Question Three

For the health behaviour of physical activity, the number of days being active in a week was measured against the QOL score of each CVD patient. It was found that there was a significant relationship. The health-related QOL of CVD patients is important as it allows health professionals to gain an insight into the patients

functioning. Due to the non-significant main effect of smoking status and QOL, this relationship was not explored further in research question three.

The present findings predict that older adults with CVD who are more active each day will have an increased health-related QOL, and vice versa. This relationship appears consistent with other studies. A study identified characteristics of and outcomes for participants who adhere to a community-based exercise program (Belza, Topolski, Kinne, Patrick & Ramsey, 2002). More than 200 participants were recruited from Washington State for a 20 week Arthritis Foundation aquatic exercise program. The results suggest that individuals who are more adherent to physical activity programs, compared to those who are less adherent, experience greater improvements in fitness, physical function, disease-specific outcomes, and QOL. Adherers were defined as those attending at least two classes per week for 16 of 20 weeks. Additionally, Morey, Pieper, Crowley, Sullivan & Puglisi (2002) reported that older adults enrolled in a physical activity program for over ten years had a long term survival benefit by time compared to the non-adherent group. This means that being healthier and potentially having less CVD risk factors are associated with higher health-related QOL.

While the literature supports the current study, it is worth mentioning that people who enrol in exercise programs are probably more motivated to adhere. Intrinsic and extrinsic motivations are associated with perceptions of self-determination. Self-determination is based on the premise that people tend to focus more time and energy in activities such as exercise, while setting goals and having a sense of incentive (Carron, Hausenblas & Estabrook, 2003). Ultimately this can lead to higher satisfaction and adherence as their intention to carry out the behaviour is higher.

If individuals with heart trouble adhere to physical activity recommendations, their risk of co-morbidity is reduced. Often co-morbidity can lead to a decreased QOL (Sprangers et al., 2000). A study compared the QOL of a wide range of chronic disease patients (Sprangers et al., 2000). Both the SF-36 or SF-24 measure was used to assess QOL. The results portray that patients who were older, female, had a low level of education, were not living with a partner, and had at least one co-morbid condition reported the lowest level of QOL. Therefore the importance of physical activity is essential to reduce the risk of co-morbidity to prevent a poor QOL.

Furthermore, the importance of adopting physical activity for those with heart trouble can lead to a higher QOL if these individuals are independent in their daily living (La Grow et al., 2011). Often older adults who are ill require assistance and the ability to engage in physical activity becomes less. Hirvensalo, Rantanen and Heikkinen (2012) studied the interaction of physical activity and mobility impairment as a predictor of dependence and mortality for those aged 65-84 years old in Finland. The study concluded that mobility impairments predicted mortality and dependence. Consequently this can lead to a lower QOL for those with CVD (Age Concern New Zealand, 1999). A key factor for positive ageing is autonomy and the freedom of choice. The desire to remain independent and to avoid being a burden to friends and family is an important part of ageing positively (Age Concern New Zealand, 1999). Often older adults are shy, or their pride may stop them from asking for assistance or company. This can influence decisions to adhering to treatment regimens such as lifestyle changes. Consequently their CVD risk will increase and health-related QOL is compromised.

Overall, the findings of research question three emphasises the NZGG (2012) guidelines of the importance of engaging in physical activity to improve health-related QOL for older adults with heart trouble.

7.5 Research Question Four

The relationship between medication and health-related QOL is a determinant for medication adherence and subsequently CVD risk factor reduction. In this study the number of prescribed drugs was measured against health-related QOL score of each CVD patient. The results showed that the higher the number of prescribed drugs, the lower the health-related QOL score compared to a lower number of prescribed drugs for older adults with heart trouble.

The significant relationship between a high number of prescribed drugs and a lower health-related QOL was not surprising considering how illness and perception of medication use can affect QOL (Bosworth, 2010). The idea that medication confirms illness can be a feeling of concern, worry and stress for many. A study aimed to

examine illness perception and its association with self-reported health-related QOL, fatigue, and distress among patients with myocardial infarction (Alsen, Brink, Persson, Brandstrom & Karlson, 2010). Approximately 200 patients completed the questionnaires at the first week of hospital admission, and then four months later. The results concluded that patients' illness perception changed over time from a more acute to a more chronic perception of illness. Additionally the beliefs in personal and treatment control of myocardial infarction had decreased. As a result, these negative perceptions of medication were associated with lowered health-related QOL. Thus, the finding of Alsen and colleagues' (2010) research is consistent with the current study.

For people who perceive that medication is not favourable i.e. against their cultural values, they are less likely to adhere to the medication regimen which may consequently decrease their QOL. Taking into account that almost half of the participants of the current study are Māori and that Māori may prefer different methods when dealing with CVD is an important topic. It is clear that different cultures would have implications for medication adherence, when clients and therapists differ in their background and worldviews. Herbert (2002) demonstrates that the topic of working with Māori; a collectivist culture, has been addressed in New Zealand by the work of Abbott and Durie since 1987. They challenged the western models of psychology to increase taha Māori (Māori issues) in psychology. Durie's work highlights that the recognition of a positive identity is the starting point for wellness for the Māori community (Durie, 1994). Māori view health and well-being as a product of four cornerstones or walls that support a house (Manna, 2002). This model is known as Te Whare Tapa Wha. The four cornerstones or dimensions include te taha wairua (spirituality), te taha hinengaro (mental well-being), te taha tinana (physical wellness), and te taha whānau (family cohesion). Should one of the four cornerstones be missing or in some way damaged, a person, or a collective may become 'unbalanced' and subsequently unwell (Manna, 2002). This may mean that Māori use other techniques when treating CVD as their understanding of health and healing are shown to be interwoven within the Te Whare Tapa Wha model, as well as hapu and iwi dimensions and connections. For Māori this may mean traditional healing methods, Rongoa (physical remedies derived from nature used to treat particular ailments), Karakia (forms of words), or Mirimiri (massage or physiotherapy) will be used when dealing with illness (Durie, 1994). Britten (1994) also reported a patient saying, "'I just don't

like artificial things... [natural remedies] are not chemically made, like flowers are naturally grown things. I prefer to take those than factory made chemicals". Consequently health professionals need to practice in a culturally competent manner and consider a range of treatment options thereby promoting adherence and better QOL for patients with CVD.

Furthermore, people may have assessed that one of the benefits of adopting the healthy behaviour is risk factor reduction that results in medication dose decreases or discontinuation of medication entirely. In this case medication serves to encourage healthy lifestyle behaviour which in turn may increase health-related QOL. A qualitative study aimed to explore the ideas about medication among 30 adult patients in two general practice locations in London (Britten, 1994). A participant reported saying, "I think why take something if you don't necessarily need it [medicine]". Therefore, negative cognitive interpretations of medication can mean that people could be more motivated to adhere to lifestyle changes. Therefore we see the association between the fewer prescribed medication and higher QOL as CVD patients are healthier. Even better, the combination of being on medication and engaging in lifestyle intervention will be advantageous to slow down the progression of CVD by minimising risk factors for the participants involved in this current study.

A further possibility might be that high cost of medication is a barrier to medication use. In New Zealand subsidised cost on medication is available to individuals to encourage medication adherence (Ministry of Health, 2013). However, for some, it is still expensive and adherence is low. For the elderly in this study, they are more susceptible to the outcomes of non-adherence. For those who have several chronic conditions (i.e. multimorbidity) often have a myriad of lifestyle interventions, and several medications (Sprangers et al., 2000). Due to multiple disease states, polypharmacy becomes problematic. Polypharmacy is the use of multiple drugs that has a detrimental effect on the health of many older adults (Montamat & Cusack, 1992). Often more medication is prescribed to counteract the result of side effects, and the elderly receive unnecessary prescription medication.

Overall research question four found that the lower number of prescribed drugs is related to a poorer QOL. Thus, non-adherence to medication due to experiencing side

effects can essentially worsen symptoms and severity of CVD as the risk of a cardiac event increases. This downward spiral then leads to a decrease in health-related QOL (Hastings, Kosmoski & Moss, 2010).

7.6 Limitations

Using a cross-sectional design was appropriate to obtain information about individuals at a specific point in time. However, it was not possible to demonstrate causality among variables. A longitudinal study would have been beneficial to investigate causality between variables and portray change over long periods of time. Using a passive design only allows for limited control. This brings us to a major issue of considering extraneous variables, which propose threats to internal validity on the effect of the dependent and independent variable.

Gender, age and ELSI were statistically control for when using the ANCOVA for the first research question. Through inclusion of these attributes, the potential effects on the dependent variable of health-related QOL were apparent and confounding was somewhat minimised. However, due to only limited control of the design, unmeasured confounds are a serious threat to internal validity.

A major limitation to this study was using secondary data. Using the information obtained from the HWR Longitudinal study limited the way of tackling the complexity of this exploratory study as the information collected was not for this specific study. Therefore control over the content was not available and thus analysis was based upon the questions of the HWR study. An important risk factor which was not addressed was diet. The HWR study had no information about consumption of a healthy diet, food availability, or portion size. For this reason this health behaviour was not able to be measured in any way. Had there been information with regard to diet, the same questions with regard to non-smoking, and physical activity would have been addressed. Due to the small sample size of participants who did not take any medication at all (n = 12), it was not possible to examine differences for people who did take medication, and for those who did not taken any medication. Had this been possible, it would have been beneficial to compare these groups with regard to lifestyle

adherence; while ensuring that factors such as age, gender, income, ELSI, were also controlled for to minimise confounding.

Moreover, instrumentation may have threatened internal validity of the study. The number of prescribed drugs could have been taken for something other than CVD. Therefore, inspecting medication use for only CVD would have been useful to determine the relationships more accurately. The health status instrument of the SF-36 was used to assess QOL however such a generic instrument may not address those issues of relevance to particular patient groups, such as disease symptoms or treatment side effects. To the extent that such disease-specific aspects do not affect the generic domains, the resulting score is only a limited reflection of patients' health status.

Furthermore, the subjective nature of the questions regarding engaging in physical activity and non-smoking was a concern as it could have lead to biased results. Socially desirable responses may have been apparent due to the fact that individuals tend to respond in favourable ways which are consistent with norms and this self-consciousness might interfere with or distort from how they actually behave outside of a research context. As a result this has the potential to affect relationships among constructs (Netemeyer, Bearden & Sharma, 2003). However, both confidentiality and anonymity were assured with the HWR study. In addition, authors such as McCrae and Costa (1983) emphasise that claims of a need to correct for this bias are unsubstantiated. Hence, the possibility that socially desirable bias affected the results is minimal.

Furthermore, due to subjective self reports there were missing cases in the HWR dataset. These are people who have not responded to the item at all. Using pairwise deletion was useful but this may have affected the analysis in various ways. Missing data constitute threats to different forms of reliability, validity, and generalisability of study results (McKnight, McKnight, Sadani & Figueredo, 2007). Possible reasons for not responding to some questions may be due to maturation processes. Filling in questionnaires can be a cognitively demanding task for older adults. Thus fatigue can affect concentration span, which ultimately threatens internal validity (Pedhazur & Schmelkin, 1991).

7.7 Future Research

While this exploratory study has been informative, there are future recommendations. A mixed-method design involving quantitative and qualitative data will be useful to combine the strengths of both approaches. This point is highlighted by Connelly (2009) who wrote, “the goal of mixed methods research is to draw on the strengths and minimise the weaknesses of both types of research” (p. 31). While quantitative research often improves on the validity of research instruments, and simplifies human experience into statistical terms, qualitative data can produce a more comprehensive understanding of phenomena (Jerome, 2011). Thus, a mixed method approach will enrich the study in the sense that it will promote clarity, accuracy and nuancy about medication, non-smoking, and physical activity. In this way it might be possible to investigate why individuals do not adhere to healthy behaviours while considering the effect of medication use. The overall analysis will be more ethical as perspectives, voices, and interests are also represented as the lived experiences are contextualised.

Due to the nature of the data and the limited information it was difficult to take into account the broader societal factors. A prospective study would use Bronfenbrenner’s ecological model as a theoretical framework to looks at four systems (microsystem, mesosystem, exosystem and macrosystem) in terms of the individual and the way in which the broader system enter the individual’s experience of having heart trouble (Kraus, 2008). Each system contains rules, norms and roles that can powerfully affect older adults who are experiencing heart trouble. By establishing the cause, the goals of the intervention will become clearer, and consequently action will be more effective as interacting facets of the physical and the social environment are considered. Thus, identifying additional factors that are associated with medication use may facilitate the design of effective intervention strategies in the future. Interventions can then explain the consequences of non-adherence to medication and lifestyle intervention in ways that CVD individuals value and understand. Ultimately, including broader factors to explain behaviours is advantageous to get a holistic view of the topic at interest.

7.8 Implications for health psychology

Few studies have investigated how medication can influence healthy behaviours for older adults with heart trouble. Meanwhile the health issue of CVD has grown to the extent where it is concerning for health professionals around the world, including New Zealand. Therefore any understanding of biological, social, and psychological factors influencing health and illness is useful. With the increasing awareness of the need to implement strategies targeting the alarming statistics of CVD, governments, health professionals, parents, and children are being forced to address this issue.

Educating individuals about adherence to healthy behaviours and medication is not enough to bring about change in behaviour. The underlying structures that are involved in decision making about behaviour and medication use need to be targeted during intervention. It would be productive to target variables of physical activity, non-smoking and diet when designing interventions to focus on the causes of CVD, effective preventative measures, the best health promotion techniques, how to assist those with pain or illness, and how to get people to seek treatment for CVD. By doing so, health psychologists can improve health status and QOL by working at the individual level with the patient, indirectly with large-scale public health programs, and by training health professionals, such as nurses, and physicians, to take advantage of this knowledge when working with their clients.

By using a holistic approach to address health issues such as CVD, means that health is a product of biological, social, and psychological processes. Taking into consideration that modern societies have a more sedentary lifestyle due to technological advances such as computers and televisions means that external factors play a role in non-adherence to positive lifestyle changes. The results of this study reinforce that lack of physical activity is associated with higher medication, and that being unhealthy is related to a lower health-related QOL. Perhaps physical activity programs should be tailored to meet specific cultural concerns, perspectives and values. For example church-based programs may be an appropriate setting for delivery of interventions.

Health psychologists are expected to adhere to ethical principles by being aware that cultures are highly heterogeneous and forever changing. Adapting professional practise

when working with Māori in New Zealand will be effective to provide an accurate assessment and effective treatment plan for each client, who is a unique blend of many influences. Insensitivity to the client can lead to poor rapport as historical expectation, such as the treaty of Waitangi, will be violated and consequently influence the client's motivation to make changes in their life.

7.9 Conclusion

The findings of this current exploratory study begin to fill gaps in literature and knowledge about mediation use and healthy lifestyle changes for older New Zealand adults living with heart trouble. The study endeavoured to see if medication use did influence adopting healthy behaviours, and to see if health-related QOL is affected. The findings demonstrate that physical activity was associated with a better QOL and that medication did not significantly moderate this relationship. However, significant main effects between medication and physical activity were evident. The higher the number of days being active increased health-related QOL, and the lower number of prescribed drugs was related to a higher QOL. Main effects between the relationship of smoking status and QOL, and smoking status and medication use were non-significant. The difference between the health behaviours of non-smoking and physical activity enforced the need for these two areas to be explored separately.

Overall this project was useful to shed light on the the inclusion of medication use on healthy lifestyle intervention. This will add to the understanding of adherence to the recommended guidelines with regard to smoking cessation, physical activity, and diet at the individual level. Additionally, the present findings of this research has portrayed that the need to address the broader social, economic and political factors. Public policy is an important level of effective action (Stephens, 2008).

Further research should expand on these findings to identify additional factors, such as medication use, that influence adherence to healthy behaviours. This will contribute to a better understanding of the epidemiological trends, social and structural factors, economic policies, and international actions. As a result this will be useful to tailor interventions to focus on the underlying aspects of adherence. Additionally, older

adults should understand whether and how their conditions (if any) affect their ability to do regular exercise. Cognitive mediators, such as self-efficacy should also be addressed for this group of people. Therefore strategies such as goal setting and modelling should be included in individualised interventions which will also address barriers by incorporating strategies particular to that person. As been discussed, this is an important aspect for health psychologists and the wider health professionals working in New Zealand.

REFERENCES

Age Concern New Zealand. (1999). *Ageing is living: A guide to positive ageing.* Wellington, New Zealand: Age Concern New Zealand incorporated.

Albery, I.P., & Munafo, M. (2008). *Key concepts in health psychology*. Great Britain: Sage Publications.

Allen, P., & Bennett, K. (2008). Multiple regression. In P. Allen, & K. Bennett (Eds.), *SPSS for the health and behavioural sciences* (1st ed., pp. 175-191). Melbourne, Australia: Thomson.

Alpass, F., Towers, A., Stephens, C., Davey, J., Fitzgerald., & Stevenson, B. (2007). Independence, wellbeing and social participation in an ageing population. *Annuals of the New York Academy of Science, 1114*, 241-250.

Alsen, P., Brink, E., Persson, L.O., Brandstrom, Y., & Karlson, B.W. (2010). Illness perceptions after myocardial infarction: relations to fatigue, emotional distress, and health-related quality of life. *Journal of Cardiovascular Nursing, 25*(2), E1–E10. doi:10.1097/JCN.0b013e3181c6dcfd

Antonisamy, B., Christopher, S., & Samuel, P.P. (2010). *Biostatistics: Principles and practice*. New Delhi, India: Tata McGraw Hill.

Belza, B., Topolski, T., Kinne, S., Patrick, D.L., & Ramsey, S.D. (2002). Does adherence make a difference? Results from a community-based aquatic exercise program. *Nursing Research, 51*(6), 285-291.

Bolliger, C.T., Zellweger, J.P., Danielsson, T., van Biljon, X., Robidou, A., Westin, A., Perruchoud, A P., & Sawe, U. (2002). Influence of long-term smoking reduction on health risk markers and quality of life. *Nicotine & Tobacco Research, 4*, 433–439.

Bosworth, H. (2010). Medication adherence. In Bosworth. H (Ed.), *Improving patient treatment adherence (pp. 69-96).* New York: Springer.

Boyle, R., O'Connor, P., Pronk, N., & Tan, A. (1998). Stages of change for physical activity, diet, and smoking among HMO members with chronic conditions. *American Journal of Health Promotion, 12*(3), 170–175.

Breakwell, G., Hammond, S.M., Fife-Schaw, C., & Smith, J.A. (2006). *Research methods in psychology* (3rd ed.). United Kingdom: SAGE Publications LTD.

Britten, N. (1994). Patients' ideas about medicines: A qualitative study in a general practice population. *British Journal of General Practice, 44*(387), 465-468.

Buckland, G., Gonzalez, C.A., Vilardell, M., Agudo, A., Berenguer, A., Amiano, P., . . . Moreno-Iribas, M. (2009). Adherence to the Mediterranean diet and risk of coronary heart disease in the Spanish EPIC cohort study. *American Journal of Epidemiology, 170*(12), 1518-1529. doi:10.1093/aje/kwp282

Cannon, C.P., & Vierck, E. (2009). *The new heart disease handbook*. Beverly, Massachusetts: Fair Winds Press.

Carron, A.V., Hausenblas, H.A., & Estabrooks, P.A. (2003). *The psychology of physical activity*. New York: McGraw-Hill.

Caterson, I.D., Finer, N., Coutinho, W., Van Gaal, L.F., Maggioni, A.P., Torp-Pedersen, C., . . . James, W.P. (2012). Maintained intentional weight loss reduces cardiovascular outcomes: Results from the Sibutramine Cardiovascular OUTcomes (SCOUT) trial. *Diabetes, Obesity and Metabolism, 14*(6), 523–530. doi:10.1111/j.1463-1326.2011.01554.x 529

Christensen, A.J., Howren, B.M., Hillis, S.L., Kaboli, P., Carter, B.L., Cvengros, J.A., . . . Rosenthal, G.E. (2010). Patient and physician beliefs about control over health: Association of symmetrical beliefs with medication regimen adherence. *Journal Of General Internal Medicine, 25*(5), 397-402, doi:10.1007/s11606-010-1249-5

Connelly, L.M. (2009). Mixed method studies. *Journal of Medical Surgical Nursing, 18*(1), 31-32.

Crawford, D., & Ball, K. (2002). Behavioural determinants of the obesity epidemic. *Asia Pacific Journal of Clinical Nutrition, 11,* 718-721. doi:10.1046/j.1440-6047.11.s8.14.x

Creswell, J.W. (2003). *Research design, qualitative, quantitative, and mixed methods approaches* (2nd ed.). SAGE Publications.

DeVane, M.S. (2006). *Heart smart: A cardiologist's 5-step plan for detecting, preventing, and even reversing health disease.* Hoboken, New Jersey: John Wiley & Sons

Dunderdalea, K., Thompson, D.R., Miles, J.N., Beer, S.F., & Furze, G. (2005). Quality-of-life measurement in chronic heart failure: Do we take account of the patient perspective? *The European Journal of Heart Failure, 7,* 572-582. doi:10.1016/j.ejheart.2004.06.006

Durie, M. (1994). Te Ao Tawhito/Māori public health systems and healing. *In Whaiora: Māori health development* (pp. 8-26). Auckland: Oxford University Press.

Ellis, J.R., McDonald, R.B., & Stern, J.S. (1990). A diet high in fat stimulates adipocyte proliferation in older (22 month) rats. *Experimental Gerontology, 25*(2), 141-148.

Felce, D., & Perry, J. (1995). Quality of life: Its definition and measurement. *Research in Developmental Disabilities, 16*(1), 51–74.

Gaziano, T.A., Bitton, A., Anand, S., Abrahams-Gessel, S., & Murphy, A. (2010). Growing epidemic of coronary heart disease in low- and middle-income countries. *Current Problems in Cardiology, 35*(2). 72-115. doi:10.1016/j.cpcardiol.2009.10.002

Greenfield, M.L.V.H., Kuhn, J.E., & Wojtys, E.M. (1998). A statistics primer: Correlation and regression analysis. *American Journal of Sports Medicine, 26*(2), 338-343.

Guo, M., Courtney, M.D., & Anderson, D.J. (2009). Examination of social demographic status, disease status, health behaviours and quality of life in older Australians using the theory of planned behaviour model. In: *Proceedings of the 8th National Conference of Emerging Researchers in Ageing*, 22-23 October 2009, Rydges on Swanston, Melbourne, Victoria.

Hastings, N.S., Kosmoski, J.C., & Moss, J.M. (2010). *Special considerations of adherence in older adults*. In Bosworth (Ed.). Improving patient treatment adherence: A clinician's guide. New York: Springer.

Heart Foundation. (2012). *Statistics: General heart statistics for New Zealand*. Retrieved March 23, 2012 from http://www.heartfoundation.org.nz/know-the-facts/statistics

Herbert, A.M.L. (2002) Bicultural partnerships in clinical training and practice in Aotearoa/New Zealand. *New Zealand Journal of Psychology, 31*(2), 110-116.

Hirvensalo, M., Rantanen, T., & Heikkinen, E. (2000). Mobility difficulties and physical activity as predictors of mortality and loss of independence in the community-living older population. *Journal of the American Geriatric Society, 48*(5), 493-498.

Howell, D.C. (2004). *Fundamental statistics for the behavioural science* (5th ed.). California, USA: Duxbury Press.

Jensen, M.K., Chiuve, S.E., Rimm, E.B., Dethlefsen, C., Tjønneland, A., Joensen, A.M., & Overvad, K. (2008). Obesity, behavioral lifestyle factors, and risk of acute coronary events. *Circulation, 117*, 3062–3069. doi:10.1161/CIRCULATIONAHA.107.759951

Jerome, D.L. (2011). The benefits and challenges of mixing methods and methodologies: Lessons learnt from implementing qualitatively led mixed methods research designs in Trinidad and Tobago. *Caribbean Curriculum, 18*, 87-120.

Kaufman, D.W., Kelly, J.P., Rosenberg, L., Anderson, T.E., & Mitchell, A.A. (2002). Recent patterns of medication use in the ambulatory adult population of the United States: The slone survey. *The Journal of the American Medical Association, 287*(3), 337–344.

Kotani, K., Tokunaga, K., Fujioka, S., Kobatake, T., Keno, Y., Yoshida, S., Shimomura, I., Tarui, S., & Matsuzawa, Y. (1994). Sexual dimorphism of age-related changes in whole-body fat distribution in the obese. *International Journal of Obesity and Related Metabolic Disorders, 18*(4), 207–212.

Kozlowski, L.T., Henningfield, J.E., & Brigham, J. (2001). *Cigarettes, nicotine, and health: A biobehavioral approach*. London: Sage Publications.

Kraus, K.L. (2008). *Lenses: Applying lifespan development theories in counselling*. USA: Houghton Mifflin Company.

Kuk, J.L., Saunders, T.J., Davidson, L.E., & Ross, R. (2009). Age-related changes in total and regional fat distribution. *Ageing Research Reviews, 8*(4), 339–348.

Kyle, U.G., Genton, L., Hans, D., Karsegard, L., Slosman, D.O., & Pichard, C. (2001). Age-related differences in fat-free mass, skeletal muscle, body cell mass and fat mass between 18 and 94 years. *European Journal of Clinical Nutrition, 55*(8), 663–672.

La Grow, S., Alpass, F., Stephens, C., & Towers, A. (2011). Factors affecting perceived quality of life of older persons with self-reported visual disability. *Quality of Life Research, 20*(3), 407-413. doi:10.1007/s11136-010-9758-6

Lane, D., Carroll, D., Ring, C., Beever, G., & Lip, G.Y. (2001). Mortality and quality of life 12 months after myocardial infarction: Effects of depression and anxiety. *Psychosomatic Medicine, 63*(2), 221–230.

Lane, N.E. (2006). Epidemiology, etiology, and diagnosis of osteoporosis. *American Journal of Obstetrics and Gynecology, 194*, S3–11. doi:10.1016/j.ajog.2005.08.047

Manna, L. (2002). Biculturalism in practice, 'Te Pounamu': Integration of a Māori model with traditional clinical assessment processes. *The Proceeding of the National Māori Graduates of Psychology Symposium 2002*, 37-44.

Marks, D.F., Murray, M., Evans, B., & Estacio, E.V. (2011). *Health psychology: Theory, research and practice* (3rd ed.). London: SAGE Publications LTD.

Marmot, M., & Elliot, P. (2005). *Coronary heart disease epidemiology: From aetiology to public health* (2nd ed.). New York: Oxford University Press.

Maron, D.J., Fazio, S., & Linton, M.F. (2000). Current perspectives on statins. *Circulation, 101*, 207-213. doi:10.1161/01.CIR.101.2.207

Martin, L.R., Haskard-Zolnierek, K.B., & DiMatteo, M.R. (2010). *Health behaviour change and treatment adherence: Evidence-based guidelines for improving healthcare*. New York: Oxford University Press.

Mayou. R., & Bryant. B. (1993). Quality of life in cardiovascular disease. *British Heart Journal, 69*, 460–466.

McCrae, R.R., & Costa, P.R. (1983). Social desirable scales: More substance than style. *Journal of Consulting and Clinical Psychology, 51*(6), 882-888.

McKnight, P.E., McKnight, K.M., Sadani, S., & Figueredo, A.J. (2007). *Missing data: A gentle introduction.* New York: The Guildford Press.

Miller, N.H. (1997). Compliance with treatment regimens in chronic asymptomatic disease. *American Journal of Medicine, 102*, 43-49.

Ministry of Health. (2012). *Implementing the New Zealand health strategy 2011*. Wellington: Ministry of Health.

Ministry of Health. (2013). *Medication.* Retrieved 07 January, 2013 from http://www.health.govt.nz/yourhealth-topics/medications

Montamat, S.C., & Cusack, B. (1992). Overcoming problems with polypharmacy and drug misuse in the elderly. *Clinics in Geriatric Medicine, 8*(1), 143-158.

Montani, J.P., Carroll, J.F., Dwyer, T.M., Antic, V., Yang, Z., & Dulloo. A.G. (2004). Ectopic fat storage in heart, blood vessels and kidneys in the pathogenesis of cardiovascular diseases. *International Journal of Obesity, 28* (Suppl 4), S58–S65. doi:10.1038/sj.ijo.0802858

Morey, M.C., Pieper, C.F., Crowley, G.M., Sullivan, R.J., & Puglisi, C.M. (2002). Exercise adherence and 10-year mortality in chronically ill older adults. *Journal of the American Geriatrics Society, 50*(12), 1929–1933. doi:10.1046/j.1532-5415.2002.50602.x

Netemeyer, R.G., Bearden, W.O., & Sharma, S. (2003). *Scaling procedures: Issues and applications* (pp.71-87). Thousand Oaks, CA: Sage.

New Zealand Guidelines Group. (2003, December). *The assessment and management of cardiovascular risk: Evidence-based best practice guideline*. Retrieved March 21, 2012 from http://ebooks.nzgg.org.nz/cvd_guideline/

New Zealand Guidelines Group. (2012) *New Zealand primary care handbook 2012*. (3rd ed.). Wellington, New Zealand Guidelines Group.

Nicholl, C.G., & Wilson, J. (2012). *Elderly care medicine: Lecture notes*. (8th ed.). United Kingdom: Wiley-Blackwell.

Nunnally, J.C., & Bernstein, I.H. (1994). *Introduction. Psychometric theory* (pp. 3-30) (3rd ed). New York: McGraw-Hill.

O'Neil, A., Stevenson, C.E., Williams, E.D., Mortimer, D,. Oldenburg, B., & Sanderson, K. (2012). The health-related quality of life burden of co-morbid cardiovascular disease and major depressive disorder in Australia: findings from a population-based, cross-sectional study. *Quality of Life Research*. doi:10.1007/s11136-012-0128-4

O'Rourke, M. (1990). Arterial stiffness, systolic blood pressure, and logical treatment of arterial hypertension. *Hypertension, 15*, 339-347. doi:10.1161/01.HYP.15.4.339

Ose, D., Wensing, M., Szecsenyi, J., Joos, S., Hermann, K., & Miksch, A. (2009). Impact of primary care-based disease management on the health-related quality of life in patients with type 2 diabetes and co-morbidity. *Diabetes Care, 32*(9), 1594–1596. doi:10.2337/dc08-2223

Packard, R.R.S., & Libby, P. (2008). Inflammation in atherosclerosis: from vascular biology to biomarker discovery and risk prediction. *Clinical Chemistry, 54*(1), 24-38. doi:10.1373/clinchem.2007.097360

Pedhazur, E., & Schmelkin, L. (1991). Research design: Basic principles and concepts. *Measurement, design and analysis* (pp. 211-233). Hillsdale, NJ: Lawrence Erlbaum.

Prapavessis, H., Maddison, R., Ruygrok, P.N., Bassett, S., Harper, T., & Gillanders, L. (2005). Using theory of planned behavior to understand exercise motivation in patients with congenital heart disease. *Psychology, Health & Medicine, 10*(4), 335–343. doi:10.1080/14639220500093483.

Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390-395. doi:10.1037/0022-006X.51.3.390

Rabkin, S.W. (2007). Epicardial fat: properties, function and relationship to obesity. *Obesity Review, 8*(3), 253–261. doi:10.1111/j.1467-789X.2006.00293.x

Rejeski, J.W., & Mihalko, S.L. (2001). Physical activity and quality of life in older adults. *Journal of Gerontology Series A: Biological Sciences and Medical Sciences, 56A*(suppl 2), 23-35. doi:10.1093/gerona/56.suppl_2.23

Rosenstock, I.M., Strecher, V.J., & Becker, M.H. (1988). Social learning theory and the health belief model. *Health Education Quarterly, 15*(2), 175-183.

Schneider, A., Komer, T., Mehring. M., Wensing, M., Elwyn, G., & Szecsenyi, J. (2006). Impact of age, health locus of control and psychological co-morbidity on patients' preferences for shared decision making in general practice. *Patient Education and Counselling, 61*(2), 292–298. doi:10.1016/j.pec.2005.04.008

Selzer, A. (1992). *Understanding heart disease*. Berkeley: University of California Press.

Sofi, F., Cesari, F., Abbate, R., Gensini, G.G., & Casini, A. (2008). Adherence to Mediterranean diet and health status: meta-analysis. *British Medical Journal, 337*, 1-7. doi:10.1136/bmj.a1344

Speechly, C., Bridges-Webb, C., McKenzie, S., Zurynski, Y., & Lucas, A. (2010). Patient and general practitioner attitudes to healthy lifestyle behaviours and medication following coronary heart disease: An exploratory study. *Australian Journal of Primary Health,16*(2), 154-158.

Sport and Recreation New Zealand. *Physical activity and nutrition in New Zealand* (n.d). Retrieved June 18, 2012 from http://www.sportnz.org.nz/Documents/Publications/Obstacles%20to%20Action/Obstacles_to_action_questionaire.pdf

Sprangers, M.A., de Regt, E.B., Andries, F., van Agt, H.M., Bijl, R., de Boer, J., . . . de Haes, H.C. (2000). Which chronic conditions are associated with better or poorer quality of life? *Journal of Clinical Epidemiology, 53*(9), 895-907.

Stamatakis, E., Hamer, M., & Primatesta, P. (2009). Cardiovascular medication, physical activity and mortality: cross-sectional population study with ongoing mortality follow-up. *Heart, 95*(6), 448–453. doi:10.1136/hrt.2008.152041

Statistics New Zealand. (2001). *2001 Census of population and Dwellings: Definitions and Questionnaires.* Wellington: Statistics New Zealand.

Statistics New Zealand. (2009). *The impact of structural population change (structural change and the 65+ population articles).* Wellington: Statistics New Zealand.

Stephens, C. (2008). *Health promotion: A psychosocial approach*. Maidenhead: Open University Press.

Stessman, J., Hammerman-Rozenberg, R., Ein-Mor, E., & Jacobs, J.M. (2009). Physical activity, function, and longevity among the very old. *Archives of Internal Medicine, 169*(16), 1476–1483. doi:10.1001/archinternmed.2009.248.

Strawbridge, W.J., Deleger, S., Roberts, R.E., & Kaplan, G.A. (2002). Physical activity reduces the risk of subsequent depression for older adults. *American Journal of Epidemiology, 156*(4), 328-334. doi:10.1093/aje/kwf047

Strine, T.W., Okoro, C.A., Chapman, D.P., Balluz, L.S., Ford, E.S., Ajani, U.A., & Mokdad, A.H. (2005). Health-related quality of life and health risk behaviors among smokers. *American Journal of Preventive Medicine, 28*(2), 182-187. doi:10.1016/j.amepre.2004.10.002

Sullivan, P.W., Ghushchyan, V., Wyatt, H.R., Wu, E.Q., & Hill, J.O. (2007). Impact of cardiometabolic risk factor clusters on health-related quality of life in the U.S. *Obesity, 15*(2), 511–521. doi:10.1038/oby.2007.580

Tabachnick, B.G., & Fidell, L.S. (2007). *Using multivariate statistics* (5th ed.). Boston: Allyn and Bacon.

The Quit Group. (2012). *Quitline*. Retrieved September 15, 2012 from http://www.quit.org.nz/

Thompson, D.R., & Yu, C-M. (2003). Quality of life in patients with coronary heart disease-I: Assessment tools. *Health and Quality of Life Outcomes, 1*(1), 42. doi:10.1186/1477-7525-1-42

Vathesatogkit, P., Sritara, P., Kimman, M., Hengprasith, B., Shyong, T., Wee, H., & Woodward, M. (2012). Associations of lifestyle factors, disease history and awareness with health-related quality of life in a Thai population. *PLoS ONE 7*(11), e49921. doi:10.1371/journal.pone.0049921

Vogel, T., Brechat, P.H., Lepretre, P.M., Kaltenbach, G., Berthel, M., & Lonsdorfer, J. (2009). Health benefits of physical activity in older patients: A review. *International Journal of Clinical Practice, 63*(2), 303-320. doi:10.1111/j.1742-1241.2008.01957.x

Walker, J.T., & Maddan, S. (2009). *Understanding statistics for the social sciences, criminal justice, and criminology*. USA: Jones & Bartlett.

Wallston, B.S., & Wallston, K.A. (1978). Locus of control and health: A review of the literature. *Health education & Behavior, 6*(1), 107-117. doi:10.1177/109019817800600102

Warburton, D.E., Nicol, C.W., & Bredin, S.S. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal, 174*(6), 801–809. doi:10.1503/cmaj.051351

Ware, J.E., Kosinski, M., Bayliss, M.S., McHorney, C.A., Rogers, W.H., & Raczek, A. (1995). Comparison of methods for the scoring and statistical analysis of SF-36 health profile and summary measures: summary of results from the Medical Outcomes study. *Medical Care, 33*(4), AS264-AS279.

World Health Organisation. (2011a). *Cardiovascular diseases: Key messages to protect heart health*. Retrieved March 21, 2012 from http://www.who.int/mediacentre/factsheets/fs317/en/index.html

World Health Organisation. (2011b). *Cardiovascular diseases: Key messages to protect heart health*. Retrieved May 03, 2012 from http://www.who.int/cardiovascular_diseases/en/

APPENDIX A

Summary table of assumption testing for each level of each independent variable.

	Normality		Homogeneity of Variance	
	Result of Kolmogrov-Smirnov	Histogram	Result of Levene's Test	Rule of Thumb
Smoking Status				
Yes	Pass	N/A	Pass	N/A
No	Fail*	Pass		
PAL				
Low	Pass	N/A	Fail*	Pass
High	Fail*	Pass		
Medication Use				
Low	Fail*	Pass	Pass	N/A
High	Pass	N/A		

Note. The 'Rule of Thumb' suggests that if the highest variance is less than four times as large as the smallest variance, then they are similar enough.
N/A stands for not applicable, because the previous test was a 'pass' result, therefore it was unnecessary to continue with less conservative tests.
* $p < .05$.