Factors related to spontaneous changes in fat intake and physical activity after coronary angioplasty

Rosemary 0live Higgins

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Faculty of Life and Social Sciences
Swinburne University of Technology
Abstract

Patients who have had the minimally invasive percutaneous coronary intervention (PCI) to treat blocked coronary arteries are less likely to make lifestyle changes than other patients with coronary heart disease (CHD). Protection motivation theory (PMT) is a useful theory to understand behaviour change. This longitudinal study used an extended protection motivation theory (PMTplus) model that also included an emotional appraisal variable, namely, distress regarding a future cardiac event, to understand predictors of behaviour change after PCI.

The current study had two aims; firstly to investigate change over time in health behaviours (saturated fat intake and walking frequency) and PMTplus measures for patients who have had a first PCI and secondly to identify which PMTplus measures predicted change in health behaviours in these patients. Structured telephone interviews were conducted with 216 consecutive PCI patients shortly after hospital discharge and again six months later. PMTplus measures were completed at both time-points, along with measures of saturated fat intake and frequency of walking.

The first aim of the study was addressed through the use of mixed model ANOVA with repeated measures to test for effects of the independent variables of cardiac rehabilitation (CR) attendance, diagnostic group membership and time on the PMTplus dependent variables and the two health behaviour measures. Results showed a significant main effect for time and no significant interaction effects for all PMTplus variables, with the exception of exercise self efficacy. Walking frequency also showed a significant main effect for time. While there was no significant main effect for time for either exercise self efficacy or saturated fat intake, a significant interaction was evident between time and CR attendance for these variables.

The second aim of the study was addressed through the use of two separate hierarchical regression analyses using change in PMTplus measures to predict change in walking and saturated fat intake. The PMTplus model explained 23% of the variance in change in walking over time. Increased walking was predicted by younger age, self efficacy and distress. The PMTplus model also explained 17% of the variance in change in saturated fat intake over time. Change in saturated fat intake was predicted by vulnerability and distress. This study identified PMTplus as a promising theoretical framework to understand behaviour change in this patient group.
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Through the completion of this thesis I have come to truly understand that all achievements are built on what others have given you. There have been many constant influences in my life which have supported me in the completion of this thesis. I am grateful to all who have encouraged me, believed in me, challenged me and loved me whilst I have undertaken this mammoth task.

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Among other constants have been my colleagues in the field of cardiac rehabilitation (CR). These colleagues comprise CR program coordinators from across Australia, participants at Australian CR conferences, participants and facilitators at the many CR training programs that I have been privileged to be involved in, as well as fellow committee members of the Australian Cardiovascular Health and Rehabilitation Association and the Victorian Association of Cardiac Rehabilitation. These colleagues have helped to shape my thinking about the needs
of both patients with coronary heart disease and the needs of the health professionals supporting them.

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I believe that achievements are built on what others have given you. I feel fortunate to have received so much and I hope that I am also able to contribute with generosity to the life of others.

Rosemary Higgins
Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma, except where due reference is made in the text of the thesis.

To the best of my knowledge, this thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis.

I further declare that the ethical principles of the Australian Psychological Society have been observed in the conduct of the work.

Signed …

Dated …..1/12/2010
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Chapter 1  CORONARY HEART DISEASE

1.1 Overview of the chapter

In this chapter the health condition known interchangeably as coronary heart disease, coronary artery disease, or ischaemic heart disease is described. For simplicity, the term coronary heart disease (CHD) will be used to refer to this chronic disease throughout this thesis. The process for the development of CHD is outlined in section 1.2 along with symptoms of acute coronary syndrome (ACS) and the risk of death and disability from ST elevated myocardial infarction (STEMI).

Section 1.3 describes the two major categories of risk factors for CHD, non-modifiable and modifiable. CHD has a multifactorial aetiology with numerous risk indicators; therefore only risk factors involved in the acceleration or progression of CHD are outlined. In section 1.3.1, the non-modifiable risk factors of older age, male gender and family history of CHD are discussed, followed by exploration of the link between non-modifiable and modifiable risk factors. In section 1.3.2 modifiable risk factors are outlined, in particular saturated fat intake and physical inactivity. The beneficial effect of reduced saturated fat consumption and increased physical activity on CHD progression is explored.

Cardiac rehabilitation (CR) is described in section 1.4 and the role of CR in assisting patients to undertake lifestyle change is discussed. Research on the beneficial effects of CR, including reduced morbidity and mortality from secondary events is also covered in this section.

Common revascularisation procedures which are undertaken on patients with CHD, namely, coronary artery bypass graft surgery (CABGS) and percutaneous coronary intervention (PCI) are covered in section 1.5. Section 1.6 reviews current research on behaviour change in PCI patients and the utilisation of CR in this patient group. The evidence reviewed in this section suggests that despite the beneficial effects of lifestyle modification after PCI, such patients are less likely than other cardiac patients to change their lifestyle. This section also reviews research on the attitudes of PCI patients to behaviour change.
1.2 **Anatomy and pathology of coronary heart disease**

Coronary heart disease (CHD) refers to disease of the heart and the coronary arteries. CHD is a chronic, progressive disease involving the deterioration of the coronary arteries. The coronary arteries originate from the first branch of the aorta and lie in a crown-like formation on the surface of the heart muscle (Newby, Wilkinson, & Cockcroft, 2005). With age, coronary arteries become thicker and less elastic. The major underlying causal mechanism for CHD is the abnormal build up of fatty cholesterol and other substances inside the lumen of the coronary arteries. Atherosclerosis is responsible for almost all cases of CHD. This process is insidious and begins with fatty streaks which are first seen in adolescence. Fatty deposits in the artery walls calcify into plaque in early adulthood and culminate in blockages due to blood clots in middle age and later (Grundy, Balady, Criqui, Fletcher, Greenland, Hiratzka, Houston-Miller, Kris-Etherton, Krumholz, LaRosa, Ockene, Pearson, Reed, Washington, & Smith, 1998). A clot may fully or partially block the artery causing an episode of acute coronary syndrome (ACS) or an ST elevated myocardial infarction (STEMI) when the artery is completely blocked (Newby, et al., 2005). The person experiencing a classical STEMI is likely to feel chest pain, pain in the right arm, shoulder and/or jaw, shortness of breath, and intense crushing sensation on the chest wall along with a range of other symptoms. However many patients experience a different range of symptoms (Newby, et al., 2005). Emergency medical care is essential. About 25% of those who have a first STEMI die within an hour (Australian Institute of Health and Welfare, 2004). In addition, patients who do not seek emergency medical care shortly after the onset of a STEMI have a high risk of permanent damage to the myocardium (heart muscle) affecting future quality of life (Newby, et al., 2005).

1.2.1 **The extent of the problem**

CHD is a serious health problem in Australia and other developed nations. Findings from the 2004–05 National Health Survey show that about 3.2% of Australians have CHD. This corresponds to around 637,900 people living with diagnosed CHD (Australian Institute of Health and Welfare, 2008). The disease kills more Australians than any other disease. CHD is not only the most common cause of sudden death in Australia (Australian Institute of Health and Welfare, 2004), it is also the largest single cause of death in Australia, accounting for 23,570 deaths in 2005 (Australian Institute of Health and Welfare, 2008). Death rates have fallen rapidly in the recent past, declining by over 40% in the decade up to 2005 (Australian
Institute of Health and Welfare, 2008). This is accounted for by a range of factors, including improvements in levels of some risk factors in the population, better medical care for those at high risk of a coronary event and improved survival after both STEMI and Non-STEMI (Australian Institute of Health and Welfare, 2004).

Notwithstanding the reduction in death from CHD in the last decade, the health costs for CHD are considerable. In 1998, almost one quarter of all prescriptions dispensed in the community were for management of CHD (Australian Institute of Health and Welfare, 2004). CHD clearly has enormous costs for the population of Australia in terms of economics, premature mortality and morbidity.

1.3 Risk factors for coronary heart disease

From an epidemiological perspective, risk factors are characteristic features of an individual or population that are associated with an increased risk of developing future disease (Michael, 2001). CHD has a multifactorial aetiology with numerous risk indicators that affect both the development and the progression of CHD. Two major categories of risk factors for CHD have been identified. They are commonly classified as either non-modifiable or immutable such as gender, age and family history of CHD or modifiable such as obesity, physical inactivity or smoking (Newby, et al., 2005).

1.3.1 Non-modifiable risk factors for coronary heart disease

Non-modifiable risk factors for CHD include older age, male gender and family history of CHD. These factors act as markers of increased risk. There is an increased absolute risk of heart disease with increased age (Wilson, D'Agostino, Levy, Belanger, Silbershatz, & Kannel, 1998). CHD accounts for 46% of deaths of Australians aged 75 years and over (Australian Institute of Health and Welfare, 2004). This is a result of the progressive accumulation of coronary atherosclerosis with ageing (Newby, et al., 2005). Indeed, age is a powerful risk factor, with most new onset CHD occurring after age 65 years (Grundy, et al., 1998). A Finnish prospective study of 14,786 men and women reported that modifiable risk factors appear to account for much of this difference in age related CHD for both men and women. In this prospective study, differences in serum total cholesterol level, blood pressure, body mass index, and diabetes prevalence explained about one-third of the age-related increase in CHD risk.
among men and around one-half for women (Jousilahti, Vartiainen, Tuomilehto, & Puska, 1999).

Being male is another non-modifiable risk factor for CHD. In 1998 Australian males under 75 experienced death rates from CHD up to three times greater than females in the same age group (Australian Institute of Health and Welfare, 2004). The onset of CHD in women lags behind men by 10 to 15 years (Grundy, et al., 1998). Again though, lifestyle factors are partly implicated in this difference. Differences in modifiable risk factor levels between the sexes, particularly HDL cholesterol and smoking, explain nearly half the difference in CHD risk between men and women (Jousilahti, et al., 1999). Findings from an international study of more than 27,000 STEMI patients also support this finding, with differences between men and women in the age of first STEMI largely explained by levels of modifiable risk factors (Anand, Islam, Rosengren, Franzosi, Steyn, Yusufali, Keltai, Diaz, Rangarajan, & Yusuf, 2008).

A family history of CHD, defined as a first degree relative under 70 having CHD, is a powerful marker of the risk of development and accelerated progression of CHD (Bennett & Magnus, 1994). A Swedish case-control study (Leander, Hallqvist, Reuterwall, Ahlbom, & de Faire, 2001) of 1622 STEMI patients demonstrated the strength of family history as a risk factor for CHD. The study reported that men with one first degree relative with CHD had double the risk of an acute cardiac event, compared with men with no such family history. Men with two or more relatives with CHD were three times more likely than men with no family history of CHD to have an STEMI. This relationship between family history and risk of an STEMI was even stronger for women. Of interest was the finding of a synergistic interaction of family history with modifiable risk factors (Leander, et al., 2001). The precise cause of familial clustering in CHD remains largely unexplained. There is evidently a complex interaction between genetic and environmental factors in affected individuals (Hawe, Talmud, Miller, & Humphries, 2003). This underscores the importance of addressing modifiable risk factors in individuals with a family history of CHD.

1.3.2 Modifiable risk factors

Modifiable risk factors affect the development as well as the progression of CHD. One of the largest case-control studies evaluating risk factors for CHD has concluded that up to 90% of the overall risk of STEMI can be attributed to modifiable risk factors (Yusuf, Hawken, Ounpuu, Dans, Avezum, Lanas, McQueen, Budaj, Pais, Varigos, & Lisheng, 2004).
Modifiable risk factors for CHD include behavioural, biomedical and psychosocial risk factors (Australian Institute of Health and Welfare, 2004; Rosengren, Hawken, Ounpuu, Sliwa, Zubaid, Almahmeed, Blackett, Sitthi-amorn, Sato, & Yusuf, 2004; Yusuf, et al., 2004).

Psychosocial risk factors, such as depression and social isolation, contribute to the progression of CHD (Bunker, Colquhoun, Esler, Hickie, Hunt, Jelinek, Oldenburg, Peach, Ruth, Tennant, & Tonkin, 2003). Although the precise causal mechanisms of this relationship are disputed, lifestyle behaviours are believed to contribute to this increased risk (Erkkila, Sarkkinen, Lehto, Pyorala, & Uusitupa, 1999; Goble & Le Grande, 2008).

Behavioural risk factors in patients with CHD include tobacco smoking, saturated fat consumption, physical inactivity and excessive alcohol intake. Biomedical, or physiological, risk factors include high blood cholesterol, diabetes and high blood pressure as well as obesity or being overweight (Australian Institute of Health and Welfare., et al., 2004; S. Bennett & Magnus, 1994; National Heart Foundation of Australia. & The Cardiac Society of Australia and New Zealand, 2007). Patients with established CHD usually have a high prevalence of modifiable risk factors (Kahan & Wandell, 2001). Both behavioural and biomedical risk factors have the potential to be modified via lifestyle change in order to reduce the risk of further CHD events in individuals with CHD (Australian Institute of Health and Welfare, 2004; Bennett & Magnus, 1994; National Heart Foundation of Australia, 2007). Behaviour change or lifestyle management is prescribed as a standard treatment for patients with CHD. In particular, reduced saturated fat consumption and increased physical activity are recommended (Goble & Worcester, 1999). The National Heart Foundation of Australia (2007) recommends that all patients with CHD be counselled to reduce saturated fat intake and increase physical activity. In addition to these recommendations, patients who smoke are strongly advised to cease the habit completely. While in no way underestimating the negative health impact of smoking, this thesis will focus on only the two recommended areas which have relevance for the vast majority of patients with CHD, physical activity and saturated fat intake.

1.3.2.1 Physical activity

A sedentary lifestyle is a potent risk factor for both the development and the progression of CHD (Goble & Worcester, 1999; Gohlke, et al., 2000). This relationship is independent of other CHD risk factors (Armstrong, Bauman, & Davies, 2000). As well as this independent relationship, increased physical activity in patients who have experienced a
cardiac event can lead to improvement in a range of biomedical risk factors including hypertension, obesity, and hyperlipidemia. In patients with established CHD, increased physical activity reduces the risk of further cardiac events (Australian Institute of Health and Welfare, 2004; Goble & Worcester, 1999; Miller, Balady, & Fletcher, 1997; Taubert, Clark, & Smith, 2007). In addition, regular physical activity can improve functional capacity, allay disease progression and reduce mortality in individuals with established CHD (Thompson, Buchner, Pina, Balady, Williams, Marcus, Berra, Blair, Costa, Franklin, Fletcher, Gordon, Pate, Rodriguez, Yancey, & Wenger, 2003). Recommendations for physical activity for individuals with existing CHD vary on an individual basis. The National Heart Foundation of Australia (2007) recommends that individuals with CHD progress over time to the recommended goal of at least thirty minutes of moderate intensity physical activity (such as walking) on most days of the week. Despite the manifold benefits of physical activity for individuals with CHD, most adults with CHD are insufficiently active to achieve such benefits (Reid, et al., 2006).

1.3.2.2 Intake of saturated fat

In 1999, the National Nutrition and Metabolism Advisory Committee of the National Heart Foundation of Australia concluded that there is good evidence that an increase in the consumption of saturated fatty acids is associated with an increase in risk of CHD (National Heart Foundation of Australia, 1999). A systematic review of randomised controlled trials concluded that there is strong evidence that reduction in the consumption of saturated fat in individuals with CHD will reduce further cardiovascular events (Hooper, et al., 2004; Mead, et al., 2006). These statements point to evidence that an increase in the consumption of saturated fatty acids is associated with an increased risk of CHD and of further cardiac events in individuals with existing CHD. Reduced saturated fat consumption in patients who have experienced a cardiac event can have beneficial effects on a range of biomedical risk factors including hypertension, obesity, and hyperlipidemia (Goble & Worcester, 1999; National Heart Foundation of Australia, 2002).

1.4 Cardiac rehabilitation

Cardiac rehabilitation (CR) is a secondary prevention program involving physical reconditioning and education about lifestyle modification (Hare, Fitzgerald, Darcy, Race, & Goble, 1995). CR education sessions aim to inform patients’ understanding of CHD and recommended lifestyle modifications. In particular such programs emphasise modification of
diet through reduction in the consumption of saturated fat as well as increased physical activity (Goble & Worcester, 1999; Hare, et al., 1995; Haskell, et al., 1994; Ornish, et al., 1998). Referral to CR is a routine part of follow-up care for cardiac patients in Australia (Goble & Worcester, 1999). Such programs are situated throughout the metropolitan, regional and rural areas of Australia (Australian Cardiovascular Health and Rehabilitation Association, 2009).

Attendance at CR has been shown to have considerable benefits for patients with CHD, with reduced morbidity and mortality from secondary events as well as a range of other benefits (Goble & Worcester, 1999). Cardiac rehabilitation is considered ‘an essential part of the contemporary care of heart disease’ according to the most recent Cochrane review on this topic (Taylor, Dalal, Jolly, Moxham, & Zawada, 2008). Physical reconditioning or exercise training has assumed an important role in CR (Linke, Erbs, & Hambrecht, 2008). Attending CR can assist patients to increase their level of physical activity (Simons-Morton, Calfas, Oldenburg, & Burton, 1998). Unfortunately, many patients do not attend CR (Sundararajan, Bunker, Begg, Marshall, & McBurney, 2004; Worcester, Murphy, Mee, Roberts, & Goble, 2004). Participation in CR is particularly low for some patient groups. Specifically, patients who are physically inactive commonly fail to attend (Lane, Carroll, Ring, Beevers, & Lip, 2001) and older patients are less likely to attend than younger patients (Cooper, Jackson, Weinman, & Horne, 2002; Evenson, Rosamond, & Luepker, 1998b). Although men and women achieve similar benefits from participation (Ades, Waldmann, Polk, & Coflesky, 1992), non-attendance is more common among women (Evenson, Rosamond, & Luepker, 1998a; Lane, et al., 2001). Lower uptake of CR has also been reported for patients who have had a minimally invasive percutaneous coronary intervention (PCI), also known as percutaneous transluminal coronary angioplasty (Worcester, Murphy, Mee, Roberts, & Goble, 2004), are unmarried (Evenson, et al., 1998a; Lane, et al., 2001), less educated (Ades, et al., 1992; Evenson, et al., 1998b) of lower socio-economic status (Cooper, et al., 2002), and non-english-speaking (Kimble & King, 1998). Clearly there is a need to investigate alternatives to CR to promote physical activity and consumption of a low saturated fat diet in patients who are unable or unwilling to attend traditional CR.

1.5 Revascularisation options

Patients with CHD commonly undergo a revascularisation procedure, either coronary artery bypass graft surgery (CABGS) or percutaneous coronary intervention (PCI). During
these procedures, blood flow to the myocardium is restored by enlarging or bypassing diseased arteries (Jackson & Goble, 2002; Newby, et al., 2005). Such treatments for CHD are largely palliative as, without substantial behaviour change, the disease will progress (Goble & Worcester, 1999; Jackson & Goble, 2002; Newby, et al., 2005). Revascularisation procedures have no effect on the underlying process of atherosclerosis that may create future occlusions at both treated and untreated sites (Hofman-Bang, et al., 1999; Wallner, et al., 1999).

1.5.1 Coronary artery bypass graft surgery

Coronary artery bypass graft surgery (CABGS) was first performed in 1968 and has since become a routine surgical treatment for CHD (Peto, 2007). During CABGS, healthy arteries are harvested and used to bypass the diseased portion(s) of the coronary artery or arteries. The procedure is extremely invasive. The chest wall must be opened and the sternum (breast bone) split. The heart is usually completely stopped and a machine (heart bypass pump) is used to perform the function of the heart. The patient usually spends around 24 hours in an intensive care unit and remains in hospital for some days after the procedure (Jackson & Goble, 2002; Newby, et al., 2005). The rehabilitation process takes many months, with patients restricted in their activities for an extended period of time (Jackson & Goble, 2002).

1.5.2 Percutaneous coronary intervention

PCI avoids the major trauma of CABGS because it does not require the opening of the patient’s chest (Newby, et al., 2005). PCI is a relatively new treatment for CHD. In recent years the beneficial outcome of early investigation and referral for PCI has been well recognised, with PCI now an established treatment for CHD and lately, a treatment used within hours of the onset of an STEMI (Phibbs, 2007). There has been an enormous increase in the numbers of PCIs performed over the past decade in industrialised countries (Bucher, Hengstler, Schindler, & Guyatt, 2000). In Australia in 2001-2002, almost 24,000 PCIs were performed (Australian Institute of Health and Welfare, 2004). In the ten year period to 2006 there was a doubling in the number of PCI procedures in Australia.

During the PCI procedure, a balloon tipped catheter is inserted through the groin and guided upwards to the coronary arteries. The balloon is expanded at the site of the blockage or narrowing within the coronary arteries. The expansion of the balloon compresses plaque on the lumen of the coronary artery enlarging the inner diameter of the artery (Ruygrok, De Jaegere,
Van Domburg, Van Den Brand, Serruys, & Feyter, 1996). A stent is often inserted to maintain the vessel opening. Compared to CABGS, the PCI procedure is minimally invasive, with patients usually discharged from hospital discharge within 24 hours after the procedure (Newby, et al., 2005). The experience of patients who have undergone PCI is vastly different from that of CABGS patients, due mainly to the less invasive nature of the procedure and reduced risk of complications (Allen, Fitzgerald, Swank, & Becker, 1990; Pocock, Henderson, Seed, Treasure, & Hampton, 1996).

PCI is effective in reducing the immediate risk of acute heart disease but does not alter lifetime risk of a myocardial infarction (Newby et al, 2005). The procedure confers immediate benefits by treating stenoses (blockages) at specific arterial sites. The procedure provides both immediate relief of symptoms (Bucher, et al., 2000) and improved functional capacity for many patients (Higgins, Hayes, & McKenna, 2001). Patients who have undergone PCI show significant improvements from baseline levels in the areas of psychosocial adjustment, including reduced fatigue and improved feelings of wellbeing in the first three months after the procedure (Ben-Ari, Rothbaum, Linnemeir, Landin, Steinmetz, Hillis, Noble, Hallam, See, & Shiner, 1989), mood status (White & Frasure-Smith, 1995) and quality of life (Faris & Stotts, 1990). A review of studies on PCI patients has found that the PCI experience was mostly viewed as positive with mood disturbance at low levels and patients experiencing low levels of heart disease threat following PCI (Gentz, 2000). In a comprehensive investigation of quality of life in 209 PCI patients, results showed highly significant improvements in symptomatic status, functional capacity, life satisfaction and psychological well-being two months after the procedure (Tooth, McKenna, Maas, & McEniery, 1997).

1.6 Health behaviour change in PCI patients

Both attendance at CR (Worcester, et al., 2004) and health behaviour change (Reid, et al., 2007) are lower in PCI patients compared with other cardiac patients. This is despite the aforementioned rapid recovery of PCI patients. There is, in fact, evidence that PCI patients are either poorly informed about health behaviour change or are actually unlikely to undertake required behaviour changes (Fletcher, 1986; Gaw-Ens & Laing, 1994; Gaw, 1992; Gulanick, Bliley, Perino, & Keough, 1998; Hanson, 1988). A review of 19 studies covering PCI patients’ experience, found that patients reported a desire for more education about risk factors and required lifestyle changes (Gentz, 2000).
1.6.1 Uptake of CR in PCI patients

Contact with patients after PCI represents an opportunity to foster lifestyle change. PCI patients who attend CR have significantly fewer major cardiac events than non-attenders (Dendale, et al., 2005). However, PCI patients have lower rates of attendance at CR programs compared with STEMI and CABGS patients (Worcester, et al., 2004). Despite reduced attendance at CR, PCI patients perceive informational knowledge as very important (Gentz, 2000).

The immediate functional improvement that PCI patients experience may reduce patients’ perception of threat and hence their motivation to attend CR (Wenger, 1991). In addition, CR programs may be relevant to the needs of PCI patients as these programs were initially designed for older patients who have had an episode of ACS or who have undergone CABGS (Goble & Worcester, 1999). The primary focus of such programs on rehabilitation rather than secondary prevention of cardiac disease may not be as relevant to PCI patients whose rehabilitation is relatively rapid. Also, PCI patients are not well-served by the current limited options for structured rehabilitation. A study of PCI patients’ preferences for information and support demonstrated that more flexibility is required in the delivery of education and support to such patients, with around 50 percent of patients wanting an alternative to the traditional outpatient group CR programs (Higgins, Murphy, Le Grande, Parkinson, Worcester, & Goble, 2005). The development of additional secondary prevention interventions for PCI patients appears to be urgently required.

Alongside patient choice or motivation, PCI patients may also be deliberately or inadvertently under-referred to CR. Clinicians belief in the reduced need for CR in PCI patients may reduce CR referral (Allen, Fitzgerald, Swank, & Becker, 1990; Cameron, et al., 1994; Wenger, 1991). Hospital systems of referral to CR are problematic, even for patients with longer inpatient stays (Higgins, Murphy, Goble, Le Grande, Elliott, & Worcester, 2008). In addition, the shortened hospital stay provides minimal opportunities for recruitment of PCI patients to CR (Franzen, Nicolay, Schannwell, Albrecht, Hopp, & Hilger, 1993; Wenger, 1991). This under-referral may not be in the patients’ best interests. Indeed patients who are not offered CR after their procedure may feel cheated (Gulanick, Bliley, Perino, & Keough, 1998).
1.6.2 Lifestyle modification in PCI patients

Effective lifestyle modification has been shown to reduce coronary risk, angina pectoris and further coronary events after PCI (Galan, Deligonul, Kern, Chaitman, & Vandormael, 1988; Hofman-Bang, et al., 1999; Lisspers, et al., 2005; Wallner, et al., 1999). To reduce the likelihood of ongoing progression of atherosclerosis, patients are advised to reduce their individual coronary risk factors mainly through lifestyle modification (Lisspers, et al., 2005). Patients are commonly advised to reduce their intake of saturated fat and increase their level of physical activity as well as to cease smoking and adhere to specific medication regimes (Tooth & McKenna, 1995).

Unfortunately, PCI patients appear to be less likely than other cardiac patients to change their health related behaviour, despite evidence that they have a higher risk of restenosis than CABGS patients. Ben-Ari and colleagues (1989) found a significant increase in cholesterol and no significant change in body weight in patients six months after a PCI. Gaw-Ens and Laing (1994) found that PCI patients reported lower levels of spontaneous lifestyle modification than STEMI patients who had not undergone PCI. Mooney and colleagues (Mooney, Shaw, Portu, Sawicki, Kilber, & Mooney, 1992) found that CABGS patients were significantly more likely to make lifestyle changes than PCI patients. McKenna and colleagues found little change in cholesterol or body mass and increased smoking rates in patients twelve months after PCI (McKenna, Maas, & McEniery, 1995). Other researchers have found that even when recommended changes are adopted, they are not maintained over the long term (Morocutti, Tuniz, & Fioretti, 1999).

These findings accord with the findings of a more recent and much larger, prospective cohort study of 782 patients, which found that patients who had undergone CABGS were significantly more active at two, four and twelve months after surgery than a comparable group who had undergone PCI. In contrast, the PCI patients reduced their physical activity (Reid, et al., 2006). A recent study of the risk factor status of 202 Australian patients, twelve months after PCI concluded that there was inadequate management of modifiable risk factors in this population. In particular, less than half the patients were sufficiently physically active and around one third of patients had two or more modifiable risk factors (Fernandez, Griffiths, Juergens, Davidson, & Salamonson, 2006). It appears that further options need to
be developed to support PCI patients in making health behaviour changes. Specific interventions tailored to the needs of PCI patients may be required.

1.6.3 Attitudes of PCI patients towards lifestyle change

There has been much speculation about the attitudes and experience of PCI patients in an attempt to understand reduced levels of lifestyle change among PCI patients. Characteristics of the PCI procedure are assumed to play a role in this reduced level of lifestyle change especially when PCI patients are compared with CABGS patients. From a patient’s perspective, PCI is associated with immediate symptomatic relief which may mitigate against the urgency of lifestyle change (Kimble & King, 1998). Lyons and colleagues reported that patients retrospectively viewed any pre-PCI anxiety as unnecessary (Lyons, Fanshawe, & Lip, 2002). Patients describe the procedure as routine (Gentz, 2000), simple and non-threatening (Gulanick & Naito, 1994). It has been speculated that the relative ease of the procedure may reduce anxiety in patients and decrease motivation for lifestyle change (Gaw, 1992; Hanson, 1988; Kimble, 1998). It is also speculated that after the procedure patients tend to view lifestyle modification as unnecessary since they no longer perceive their CHD as a threat to health, due to their expectations of complete recovery fostered by both the immediate symptomatic relief along with a short hospital stay (Kimble, 1998).

Several authors have speculated that the lack of lifestyle change may be due to patients’ perception of PCI as a cure rather than a symptomatic treatment (Fletcher, 1986; Gaw-Ens & Laing, 1994; Gaw, 1992; Jenkins & Kotra-Ottaboni, 1991; Peterson, 2006; Shaw, et al., 1986). PCI patients are also reported to perceive themselves as less sick than other cardiac patients, leading to speculation that such an attitude may reduce the patient’s motivation to change lifestyle behaviours (Gaw, 1992; Shaw, et al., 1986). In a very concerning finding, twelve to eighteen months after their procedure one third of PCI patients, all of whom would have had ongoing CHD, did not believe that they still had a heart problem (Fernandez, et al., 2006), with patients apparently believing that the ‘cure’ was complete. An exploratory study of the experience of patients undergoing PCI also found that patients tended to see their condition as acute rather than chronic, with the treatment seen as curative (Astin, Closs, McLenachan, Hunter, & Priestley, 2009). Indeed, a recent study has reported that patient expectations of the benefits of coronary revascularisation have been found to be
significantly more optimistic than those of their treating physicians (Whittle, Conigliaro, Good, Kelley, & Skanderson, 2007).

Much of the speculation regarding limited behaviour change in PCI patients may be summarised as due to a limited motivation to change, driven by inaccurate perceptions of the threat of CHD and the effectiveness of PCI. Despite the level of speculation, addressed above, regarding the important role of threat perception in understanding behaviour change in PCI patients, there has been little high quality, systematic research into relationships between perceptions and lifestyle change in PCI patients. Studies which have explored lifestyle change in PCI patients have largely used retrospective designs, with relatively modest sample sizes.

In addition to these issues, PCI patients have been largely treated as a homogenous group. However, such patients may differ in their level of disease progression and may have undergone a first PCI or numerous such procedures. Patients may have been admitted for emergency treatment with ACS having had a STEMI or non-STEMI. Patients may also differ in their disease history with some having had numerous previous PCIs, multiple episodes of ACS or CABGS prior to undergoing the intervention. These differences between patients treated with PCI may impact on their perception of their PCI and their willingness to undertake behaviour change. A study of 117 patients undergoing elective PCI found significantly higher levels of pre-PCI anxiety in patients who had had a STEMI prior to PCI, compared with patients who had not had an STEMI (Astin & Jones, 2004). Clearly, some caution is required when reaching conclusions about this diverse group of patients with CHD who have undergone PCI.

1.7 Summary and conclusions

CHD is a chronic, progressive disease involving the deterioration of the coronary arteries. CHD is a serious health problem affecting 3.2% of all Australians. CHD has enormous costs in terms of economics, premature mortality and morbidity. The aetiology of CHD is multifactorial with numerous risk indicators, both modifiable and non-modifiable. Much of the overall risk of CHD can be attributed to modifiable risk factors. Patients with established CHD usually have a high prevalence of modifiable risk factors. Therefore, behaviour change is prescribed as a standard treatment for patients with CHD, in particular reduction of saturated fat consumption and increased physical activity. Changes in these two behaviours can lead to improvement in a range of biomedical risk factors and reduce the risk of further events in
patients with existing CHD. Referral to CR programs supports patients in their self
management of CHD. Attendance at CR has been shown to have considerable benefits for
patients with CHD, with reduced morbidity and mortality from secondary events as well as a
range of other benefits. Unfortunately, despite these manifold benefits many patients,
particularly PCI patients, do not attend CR.

Patients with CHD commonly undergo either CABGS or PCI and are counselled about
the need for lifestyle change. In contrast to CABGS, PCI is a minimally invasive procedure. As
such, the experience of patients who have undergone PCI is vastly different from that of
patients who have had CABGS. PCI patients generally experience an immediate relief of
symptoms and rapidly improved functional capacity as well as sustained improvement in
quality of life and psychological wellbeing. Yet, despite these benefits, PCI patients are less
likely than other cardiac patients to attend CR or to change their lifestyle behaviours. There has
been much speculation about the reasons for reduced lifestyle change among PCI patients. This
lack of behaviour change is speculated to be due to a limited motivation to change, driven by
inaccurate or insufficient perception of the threat of CHD. However, despite a high level of
speculation in the literature concerning the factors underlying reduced behaviour change in this
population, there has been little systematic, high quality research in this area.

Given the increasing number of patients treated with PCI, the need to understand which
factors influence lifestyle change in this patient group is becoming more pressing. Although
lifestyle change is known to be beneficial for all patients with CHD, patients who have had a
PCI are less compliant with lifestyle recommendations. Traditional CR programs may not be
meeting the needs of PCI patients. Patients who have had a PCI may require different
interventions to encourage behaviour change. An improved understanding of the factors that
influence change may assist us to design programs to better target the secondary prevention of
CHD in this population. It is possible that more individualised programs may be required for
PCI patients.
Chapter 2  PROTECTION MOTIVATION THEORY

2.1 Overview of the chapter

This chapter offers a detailed description of Protection Motivation Theory (PMT) and a review of the literature. Section 2.2 covers the use of theoretical frameworks in the understanding of behaviour change. A brief overview of PMT in section 2.3 covers the cognitive appraisal processes of PMT and describes both threat appraisal and coping appraisal. Section 2.4 provides justification for the selection of PMT as the model of interest in this thesis. Section 2.5 covers two recent meta-analyses of PMT evidencing the utility of PMT and summarises the findings from both works. Experimental evidence for PMT is included in section 2.6. This section reviews experimental studies that have used the threat of CHD to manipulate physical activity and dietary intake intentions and behaviours. Cross-sectional studies of PMT components in both community samples and also in patients with CHD are reviewed in section 2.7. The focus of this section has been on studies which have looked at health behaviours in response to the threat of CHD. Section 2.8 suggests that PMT is limited in application to patient groups due to the theory’s focus on cognitive appraisals. This section highlights the importance of emotional appraisal alongside cognitive appraisal. In section 2.9 the PMTplus model is introduced. This model includes the traditional PMT components as well as a measure of emotional appraisal broader than Roger (1975) original fear component. Section 2.10 is a summary of the chapter, which synthesises the work from the previous sections.

2.2 Theoretical frameworks

The development and testing of theoretical frameworks is crucial to the scientific understanding of what influences peoples’ decisions to adopt health promoting lifestyles (Conner & Norman, 1996; Norman & Conner, 2005). Testing of such frameworks can inform the development of interventions designed to improve health and prevent illness (Adler & Matthews, 1994). To date, programs that have been developed to assist people with CHD to modify their lifestyle behaviours have developed from a largely atheoretical base (Godin, Valois, Jobin, & Ross, 1991; Oldridge, 1988). A theoretical approach would strengthen understanding of behaviour change in the broader population of patients with CHD. There has
been scant research that has systematically applied established psychological theories to the analysis of factors which affect changes in physical activity or dietary habits in the broader population of cardiac patients. In the specific group of PCI patients, which is the focus of this thesis, psychological theories have not been employed to enhance understanding of the experience of these patients.

2.2.1 Use of theoretical models to investigate change in physical activity or dietary habits in patients with CHD

Numerous theoretical models have been developed to classify the multitude of factors that influence health behaviour choices. According to Weinstein (Weinstein, 2003), the four theories that are most frequently used in research on health behaviour are the Health Belief Model (Janz & Becker, 1984), Subjective Expected Utility Theory (Sutton, 1982), the Theory of Planned Behaviour (Ajzen, 1985) and Protection Motivation Theory (Rogers, 1983).

Of these models, the Health Belief Model (Janz & Becker, 1984), the Theory of Planned Behaviour (Ajzen, 1985) and Protection Motivation Theory (Rogers, 1983) have all been used to explore exercise behaviour following a cardiac event (Al-Ali & Haddad, 2004) (Blanchard, 2008; Blanchard, Courneya, Rodgers, Fraser, Murray, Daub, & Black, 2003; Johnston, Johnston, Pollard, Kinmonth, & Mant, 2004; Reid, Tulloch, Kocourek, Morrin, Beaton, Papadakis, Blanchard, Riley, & Pipe, 2007b) (Blanchard, Reid, Morrin, McDonnell, McGannon, Rhodes, Spence, & Edwards, 2009; Plotnikoff & Higginbotham, 1998; Reid, Tulloch, Kocourek, Morrin, Beaton, Papadakis, Blanchard, Riley, & Pipe, 2007a; Tulloch, Reida, D'Angelo, Plotnikoff, Morrina, Beatona, Papadakisa, & Pipe, 2009b). Interestingly, while a variety of theoretical models have been applied to the study of exercise behaviour in patients with CHD, it appears that only Protection Motivation Theory (PMT) has been applied to both dietary and exercise behaviour in patients with CHD (Plotnikoff & Higginbotham, 1995; Plotnikoff & Higginbotham, 1998). A further factor in the selection of PMT as the model of interest is that of these four common theories of health behaviour change, only PMT explicitly refers to self-efficacy (Weinstein, 2003). This factor leads to consideration of PMT as the model of choice in the exploration of health behaviours in patients with CHD given that previous research has clearly demonstrated self-efficacy to be a key variable in the prediction
of health behaviour change in this patient group (McCann, Retzlaff, Dowdy, Walden, & Knopp, 1990; Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009b; Woodgate & Brawley, 2008).

2.3 Brief overview of protection motivation theory

Protection Motivation Theory (PMT) is a major theory of health psychology which may inform understanding of psychological factors which impact on behaviour change in PCI patients. The theory provides a useful model of the way that people respond to threats (Wurtele & Maddux, 1987). PMT can be used as a model of health decision making (Milne, Sheeran, & Orbell, 2000). The original version of PMT was first introduced as a theory by Ronald Rogers in 1975 (Rogers, 1975). This version grew out of research on fear appeals. PMT was introduced in order to increase the understanding of the role of fear appeals in the prediction of attitude change (Boer & Seydel, 1996; Floyd, Prentice-Dunn, & Rogers, 2000; Milne, et al., 2000; Rogers, 1975; Rogers, 1983; Rogers & Prentice-Dunn, 1997).

PMT emphasises the cognitive processes that mediate behaviour change. The role of protection motivation is to arouse, sustain and direct protective health behaviour (Milne, Orbell, & Sheeran, 2002). In much of the work on PMT, protection motivation is synonymous with the intention to perform an adaptive behaviour (Rogers, 1983). The theory helps to explain responses to threats where no specific, immediate bodily response is required. Ongoing adaptation to living with CHD is an example of one such threat. Rogers (1983) observed that while immediate responses to threat are facilitated by physiological arousal, the response to future threats is facilitated instead by cognitive appraisals. The avoidance of future threats requires sustained attitudinal and behavioural change. Rogers claims that the cognitive appraisal processes outlined in PMT are the crucial mediating processes of this attitudinal and behavioural change (Rogers, 1983).

The major assumptions of PMT are that protection motivation is a function of the belief that the threat is severe and one is personally vulnerable to this threat, that the coping response will effectively reduce the threat and one has the ability to perform the coping response (Rogers, 1983). The amount of protection motivation elicited is a function of threat appraisal and coping appraisal (Boer & Seydel, 1996; Floyd, et al., 2000; Maddux & Rogers, 1983; Milne & Orbell, 2000; Milne, et al., 2002). Roger’s concepts of intrinsic rewards and response costs, although still evident in the latest description of the model (Rogers & Prentice-Dunn, 1997), have been largely ignored by most studies that have tested the components of the
PMT (Glanz, Lewis, & Rimer, 1990). The reasons given for this have been both the need for parsimony and the potential untestability of the full model when rewards and response costs are included (Schwarzer, 1992). Apart from the original authors, most researchers have used only the basic components of PMT (threat appraisal and coping appraisal) when testing the model, as shown in Figure 1. The components of this simplified PMT model will be described in detail below.

2.3.1 PMT threat appraisal

Threat appraisal involves the assessment of the existence of a threat. Threat appraisal is comprised of two processes, perceived vulnerability and perceived severity. Perceived vulnerability refers to the individual’s perception of how personally susceptible they are to the threat. Perceived severity refers to the individual’s perception of how serious that threat would be to the individual’s life and welfare (Rogers & Prentice-Dunn, 1997). When both perceived vulnerability and perceived severity are high, an individual is presumed to experience a significant degree of personal threat. Fear is seen to influence protection motivation indirectly, by affecting perceived severity (see Figure 1) (Rogers, 1975; Rogers, 1983; Rogers & Prentice-Dunn, 1997).

2.3.2 PMT coping appraisal

If an individual has high threat appraisal, then coping appraisal becomes relevant. The coping appraisal process involves the individual assessing whether they can cope with and prevent the threatened danger (Floyd, et al., 2000; Milne, et al., 2000). The two coping appraisal processes are self efficacy and response efficacy. Self efficacy refers to an individual’s belief that they can successfully perform the recommended health behaviours. Response efficacy refers to the individual’s belief that the specified health behaviour will avert the threatened outcome.
2.4 Choice of PMT as the theoretical framework

There is a strong empirical base for PMT which includes evidence from experimental, correlational and predictive studies. The PMT model has been used to understand health behaviours including smoking cessation (Rogers, 1975); adherence to medication regimes (van der Velde & van der Pligt, 1991); Human Immunodeficiency Virus (HIV) risk reduction (Rippetoe & Rogers, 1987; Seydel, Taal, & Wiegman, 1990; Steffen, 1990); reduced dietary fat consumption (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998); parental adherence to eye patching in children with amblyopia (Norman, Searle, Harrad, & Vedhara, 2003); sun protective behavior among individuals with a family history of melanoma (Azzarello, Dessureault, & Jacobsen, 2006); and genetic testing (Helmes, 2002).

PMT is popular in health promotion because it facilitates a comprehensive approach to motivational factors that have been shown to affect health behaviours. PMT has been used as the guiding theoretical foundation for a range of health promotion interventions (Maddux & Rogers, 1983; Stanley & Maddux, 1986). For example, PMT has underpinned behavioural
interventions designed to increase exercise behaviour (Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008); promote breast self-examination (Milne, et al., 2002); increase condom usage (Maddux & Rogers, 1983); and improve medication adherence (Fry & Prentice-Dunn, 2006). The main fields of application to date have been the reduction of risk behaviours and the enhancement of diagnostic health behaviours (Kaljee, Genberg, Riel, Cole, Tho, Thoa, Stanton, Li, & Minh, 2005; Stanton, Cole, Galbraith, Li, Pendleton, Cottrel, Marshall, Wu, & Kaljee, 2004; Stanton, Li, Galbraith, Feigelman, & Kaljee, 1996). Two separate meta-analyses of PMT (Floyd, et al., 2000; Milne, et al., 2000), outlined in section 2.5, point to the utility of this theory for understanding the adoption of health behaviours in patient groups.

2.5 Meta-analyses of Protection Motivation Theory

Two recent meta-analyses of PMT have been conducted (Floyd, et al., 2000; Milne, et al., 2000), both of which concluded that PMT was a viable model to assist in the understanding of health behaviour change. The meta-analysis conducted by Milne, Sheeran and Orbell (2000) was limited to studies with outcome measures of intended or actual health behaviours while the meta-analysis conducted by Floyd and colleagues (Floyd, et al., 2000) was much broader in scope. The results of both meta-analyses are reported, along with the relevance of the results to the study of change in diet and physical activity behaviours in patients with CHD.

2.5.1 Meta-analysis 1: Milne, Sheeran and Orbell (2000)

The meta-analysis conducted by Milne, Sheeran and Orbell (2000) investigated the use of PMT as a predictive model. This meta-analysis included studies of disease screening behaviours, for example breast self examination (Milne, et al., 2000), as well as the disease prevention or lifestyle behaviours, of particular interest to this thesis. Milne and colleagues investigated the utility of PMT as a model to predict both intention and behaviour. In total, 27 studies with a total of 7,694 participants fulfilled the criteria for inclusion. The study used both meta-analytical and vote count techniques to analyse their data. Meta-analysis was used to examine the strength of associations between the PMT variables and intention and behaviour in the 12 studies which met the criteria for inclusion in the analysis. Vote count was used to examine how often significant associations occurred between PMT variables and intention and behaviour in the studies examined. In the vote count procedure, the number of times that the variable significantly predicted intention and behaviour was counted and recorded as a
percentage of the total number of times that the association was tested. This procedure was used for 21 studies where suitable data were available (Milne, et al., 2000).

The relationship of PMT variables with intention, concurrent behaviour and future behaviour were analysed separately by Milne and colleagues (Milne, et al., 2000). Studies with cross-sectional designs were used to investigate the relationship of PMT variables with intention and also with concurrent behaviour. In total, eight such studies were included in the meta-analysis, with an additional four included in the vote count procedure. The relationship between PMT variables and subsequent behaviour was assessed using five studies in the meta-analysis (Milne, et al., 2000), with an additional three included in the vote count procedure.

Results from Milne, Sheeran and Orbell’s (2000) meta-analysis showed that all PMT variables had significant correlation (all \( p < .001 \)) with intention to adopt specific health promoting behaviours (Milne, et al., 2000). Results were largely similar when concurrent behaviour was investigated, with all PMT variables significantly correlated with concurrent behaviour (\( p < .001 \) for all except fear \( p < .01 \)) (Milne, et al., 2000). Not surprisingly, associations with subsequent behaviour were weaker and less stable than either associations with intention or concurrent behaviour. Of the PMT variables, only self efficacy (\( p < .001 \)) and perceived vulnerability (\( p < .01 \)) were significantly associated with subsequent behaviour. It is important to note that the number of studies utilised to explore the relationship of PMT variables and future behaviour was quite small, with only five studies included, hence some degree of caution needs to be adopted when drawing conclusions in regard to the utility of the PMT model in the prediction of future behaviour.

In all three components of the meta-analysis (intention, concurrent behaviour, future behaviour), it was apparent that associations with coping appraisal variables were stronger than associations with threat appraisal variables. In the area of intention, strong associations were observed for coping appraisal variables (self efficacy \( r^+ = .33 \) and response efficacy \( r^+ = .29 \)), while weaker associations were observed for threat appraisal variables (perceived severity \( r^+ = .10 \), perceived vulnerability \( r^+ = .16 \) and fear \( r^+ = .20 \)). In the area of concurrent behaviour, the pattern of association for the coping appraisal variables differed with self efficacy having a much stronger association with concurrent behaviour than response efficacy (self efficacy \( r^+ = .36 \) and response efficacy \( r^+ = .17 \)) (Milne, et al., 2000). The strength of association between concurrent behaviour and the threat appraisal measures was smaller (severity \( r^+ = .10 \),
The single study which reported on the relationship between fear and concurrent behaviour showed a medium level of association \( (r^+ = .26) \) (Milne, et al., 2000). In the area of subsequent behaviour the coping appraisal measure of self efficacy \( (r^+ = .22, p < .001) \) was significantly associated with subsequent behaviour along with the threat appraisal variable of perceived vulnerability \( (r^+ = .12, p < .01) \). No significant association was observed for either perceived severity or response efficacy with subsequent behaviour. Unfortunately, limited robustness to change was evident, particularly for the threat appraisal variables which required only a small number of potential null results to conclude that there was no significant relationship between threat appraisal and concurrent behaviour (Milne, et al., 2000). In all components of the meta-analysis, no PMT variables reached Rosenthal’s (1991) tolerance level meaning the robustness of the findings is limited. Self efficacy was the most robust variable, being within one point of meeting Rosenthal’s (1991) tolerance level in the analysis of both intention and concurrent behaviour (Milne, et al., 2000).

A similar pattern of results was observed when the vote count procedure was utilised with the PMT coping appraisal variables displaying a stronger relationship in all three areas (intention, concurrent behaviour and future behaviour) than the PMT threat appraisal variables. The PMT variable that was most frequently associated with intention was self efficacy, with a significance ratio of 70%. Response efficacy was significantly related to intention in nearly half of all hypotheses tested, with a significance ratio of 47% (Milne, et al., 2000). The threat appraisal variables of vulnerability and severity were less often associated with intention across studies, with significance ratios of 31% and 23% respectively (Milne, et al., 2000).

In the area of concurrent behaviour, self efficacy was also most frequently associated with concurrent behaviour (76%). Response efficacy was significantly associated with concurrent behaviour in around one third of all hypotheses tested, with a significance ratio of 30%. Interestingly, the threat appraisal component of vulnerability was associated with concurrent behaviour in just over half of all hypotheses tested (52%), while the significance ratio for perceived severity was much lower at 19% of all hypotheses tested.

In the area of subsequent behaviour, once again the coping appraisal variable of self efficacy (42%) had the most frequent association. Response efficacy again had a significance ratio of just under one third of all hypotheses tested (29%). The threat appraisal variables of
vulnerability (14%) and severity (17%) had lower levels of association with subsequent behaviour than observed for the coping appraisal components (Milne, et al., 2000).

Type of study appeared to influence findings with threat appraisal variables more successful at predicting intention in experimental than in correlation or intervention studies (Milne, et al., 2000). This could be due to the abstraction of threat being more easily manipulated in an experimental study than the real-world experience of threat examined in observational and intervention studies.

2.5.2 Meta-analysis 2: Floyd, Prentice-Dunn & Rogers (2000)

Floyd, Prentice-Dunn and Rogers (2000) conducted a broad meta-analysis of research on PMT which included 65 studies, with a combined sample size of almost 30,000 participants. Alongside disease prevention and disease screening behaviours, Floyd and colleagues included a variety of other protective behaviours. More than 20 health issues were represented. The most common were cancer prevention, lifestyle behaviours (including diet and physical activity), smoking cessation, condom use, alcohol consumption and adherence to medical regimens. A subgroup analysis informs us about the particular behaviours of interest to this thesis, namely, the adoption of healthy lifestyle behaviours. In this meta-analysis, studies with outcome measures of intention and behaviour were analysed together. A number of subgroup analyses were conducted which augmented the results of this large meta-analysis.

Results of the meta-analysis showed that all PMT variables correlated significantly with the outcome measures of intention and behaviour, with all having significant effect sizes (Floyd, et al., 2000). A similar pattern was observed to that seen in the meta-analysis conducted by Milne and colleagues (Milne, et al., 2000) where coping appraisal, in particular self efficacy, had a stronger relationship with outcome measures than did threat appraisal. Self efficacy had the largest effect size ($d^+ = .88$) demonstrating the strongest association with protection motivation. Response efficacy had a moderate effect size; ($d^+ = .54$). Moderate effect sizes were also observed for the threat appraisal components of perceived vulnerability and perceived severity ($d^+ = .41; d^+ = .39$ respectively) (Floyd, et al., 2000). Although this paper states that tolerance levels (Rosenthal, 1991) were calculated for each variable, these were not reported. Unfortunately, the reader is left without data on the robustness of the reported associations.
A subgroup analysis was conducted to test for difference between intentions and behaviours using a subsample of 23 studies which included both intention and behaviour as outcome measures. Mean effect sizes for intention and behaviour for components of PMT were calculated (Floyd, et al., 2000). In a similar pattern to that observed in the previously described meta-analysis (Milne, et al., 2000), mean effect sizes were stronger for intention than behaviour for both coping appraisal (intention $d+ = .70$; behaviours $d+ = .51$) and threat appraisal (intention $d+ = .56$; behaviours $d+ = .41$). Unfortunately, only overall mean effect sizes are reported for combined threat and combined coping variables (Floyd, et al., 2000). This limits the understanding of the association of specific PMT components with intention and behaviour.

A second subgroup analysis was performed to compare the 10 studies which explored adherence to exercise, diet or medical treatment regimes with studies which focused on cancer screening (Floyd, et al., 2000). This analysis yielded interesting results with different patterns of association evident between the two groups of studies. In the area of exercise, medication or diet regime adherence there were exceptionally strong associations ($d+ = .98$) with the coping variables. Strong associations with coping variables were also found in the area of condom usage for HIV prevention ($d+ = .65$). All these areas have the ongoing requirement of commitment to the health behaviour on a daily or near daily basis in common. In particular, adherence to diet and medication regimes would require an ongoing daily commitment. Adherence to ongoing behavioural regimes requires a high level of mindfulness in relation to the health condition and related behavioural requirements. In addition such adherence requires the individual to have the capacity to overcome personal and interpersonal barriers in order to integrate the behaviours into their lifestyle. Given this level of individual demand, it is not surprising that coping variables are important predictors of adherence to ongoing lifestyle behaviours.

The association of coping variables was much weaker in studies conducted in the area of cancer detection or screening ($d+ = .40$). Interestingly, for cancer detection behaviours, such as breast self examination, threat appraisal variables had a stronger relationship to protective behaviours ($d+ = .49$) than coping appraisal variables. This makes intuitive sense. Compared to the challenge of maintaining daily adherence to a strict regime, the performance of a breast self examination at monthly intervals is a relatively simple task.
requiring fewer coping resources. Compliance with such a task could be motivated by fear (threat appraisal) rather than coping appraisal (Floyd, et al., 2000). It seems that the PMT threat and coping appraisal components have a different pattern of relationship in disease detection behaviours that require intermittent attention to protection motivation (for example monthly breast self examination) compared to that found in disease prevention behaviours (such as diet or exercise regimes). The authors state that while coping appraisals are important in all of the main areas of PMT research, such appraisals are particularly influential in the area of adherence to daily regimes (Floyd, et al., 2000).

### 2.5.3 Conclusions from meta-analyses

Both meta-analyses point to the utility of PMT as a theory to understand health behaviour change, with all PMT components associated with both intention and behaviour. Not surprisingly, the model has been shown to be a better predictor of intention than behaviour (Floyd, et al., 2000; Milne, et al., 2000). A wide variety of factors may influence the translation of intention into actual behaviour change. There is less support for the PMT model’s utility in the prediction of future behaviour (Milne, et al., 2000). Both meta-analyses demonstrate a stronger effect for coping appraisal components than for the threat appraisal components of the model (Floyd, et al., 2000; Milne, et al., 2000). In particular, self efficacy emerged as the most robust component of the model. The strongest association between coping appraisal and outcome measures was in disease prevention rather than disease detection (Floyd, et al., 2000). The authors of both meta-analyses state that increased understanding of the relative impact of the key variables of PMT will help to establish which components of the model are the most useful to target in health education interventions (Floyd, et al., 2000; Milne, et al., 2000).

### 2.6 Experimental evidence for PMT

PMT has the advantage over other theories of behaviour change in that it has been consistently subjected to experimental tests over the last two decades. This section focuses on experimental studies that have used the threat of CHD as a motivator to undertake regular physical activity or adopt a low fat diet. Experimental tests of PMT generally assess individuals’ intentions to change their behaviour immediately after exposure to a persuasive communication such as written health information. Information contained in the text of the persuasive communication generally covers disease or threat characteristics, such as information about the severity of a specific disease or other threat (perceived severity), and
information about the person’s level of vulnerability to the specific disease or threat (perceived vulnerability). Information about the effectiveness of a specific behaviour required to either prevent or detect the disease (response efficacy) and information about how easy or difficult it would be for the individual to perform this response (self efficacy) is also commonly included. The experimenter can manipulate the level of variables relating to each PMT component. The impact of high or low levels of these variables on intentions to perform an advised behaviour to mitigate the threat is then assessed.

In a note of caution, it is important to point out that most experimental studies of PMT have used convenience samples of undergraduate students. This leaves us with little information about the generalisability of findings from such experiments to the wider population, and particularly to patient groups. Furthermore, such experimental studies are artificial. Information about a specific disease is presented to participants who may have neither requested the information, nor have concerns about the specific disease, or their health in general. Thus, the health threat conveyed by the persuasive communication may not be salient to participants. This may limit the applicability of such findings to patient groups, who generally both request information and have specific health concerns. In a further limitation, most studies in this area have focused on intention to perform specific health behaviours, with intention usually measured immediately after the provision of information about a disorder. Few studies have included actual behaviours measured at follow up and, when follow up periods have been used, these have been only one or two weeks after the experiment. Notwithstanding these shortcomings, experimental manipulations provide valuable information about specific PMT components.

### 2.6.1 Experimental studies of PMT with CHD as the threat

Few experimental studies have used the threat of CHD as a motivator for behaviour change. The few studies in this area have focused on physical activity with information about the threat of CHD manipulated to measure the effect of threat level on exercise motivation (Fruin, Pratt, & Owen, 1992; Stanley & Maddux, 1986; Wurtele & Maddux, 1987). Findings from these three studies are summarised in Table 2.1.

Stanley and Maddux (1986) assessed the impact of high and low levels of the PMT coping appraisal variables – response efficacy and self efficacy – in a population of female undergraduate students (N=195). High levels of both response efficacy and self efficacy
were independently associated with intention to sign up for an exercise program in this population. Fruin and colleagues (Fruin, Pratt, & Owen, 1992) manipulated coping appraisal components of PMT to investigate CHD prevention as a source of exercise motivation. Their sample comprised 615 high school students. In this study, only self efficacy was positively related to intention to exercise, however, response efficacy interacted with self efficacy. Students who were given messages that were high in both response and self efficacy had a higher level of intention to exercise than students who were given messages that were high in self efficacy but low in response efficacy.

Wurtele and Maddux (1987) used a sample of undergraduate women (N=160) to investigate threat of heart attack and stroke as a source of exercise motivation. Outcome measures included both intention to exercise and self reported exercise behaviour, measured two weeks after exposure to a persuasive communication. In this study, levels of four components of PMT (perceived vulnerability, perceived severity, response efficacy and self efficacy) were independently manipulated. Results showed higher levels of perceived vulnerability and self efficacy significantly enhanced both intention to exercise and reported exercise behaviour at follow up (two weeks). The study found that increased vulnerability and increased self efficacy interacted positively to effect intentions to exercise. Results failed to support the importance of response efficacy and perceived severity with weak main effects for both these variables (Wurtele & Maddux, 1987).

The study by Wurtele and Maddux lends support to the position of Sturges and Rogers (1996) that increased fear appeals are insufficient in motivating the adoption of ongoing behavioural regimes and that such appeals need to be accompanied by an intervention to increase coping appraisal. Increased threat arousal which is not accompanied by the promulgation of a coping behaviour may lead an individual to adopt a position of helplessness and passivity in response to a threat.

2.6.2 Conclusions from experimental studies of PMT

These three experimental studies using CHD as the threat condition demonstrated that the PMT coping appraisal variable of self efficacy was significantly related to both intention to exercise (Fruin, et al., 1992; Stanley & Maddux, 1986; Wurtele & Maddux, 1987) and actual exercise behaviour (Fruin, et al., 1992). Response efficacy was independently associated with intention in one study (Stanley and Maddux, 1986) and
interacted with self efficacy in another (Fruin, et al., 1992). Of the threat appraisal variables, perceived vulnerability was significantly related to intention to exercise and also exercise behaviour in one study (Wurtele & Maddux, 1987) and also interacted with self efficacy in the area of exercise intention (Wurtele & Maddux, 1987). Perceived severity was not significantly related to intention or behaviour in any of these three studies.

2.7 Quasi experimental studies of PMT to predict health behaviours

A number of studies have utilised PMT constructs to predict health related behaviours. In this design, individuals’ threat and coping appraisals for a specific disease are assessed along with information about specific health behaviours. This enables exploration of the association between the components of the PMT model and intentions and (in some cases) behaviours. This section is presented in two parts. First, studies which have used this design to investigate health behaviours, in particular dietary fat consumption and physical activity, in community samples are reviewed. Second, and of particular interest to this thesis, studies that have investigated the relationship between PMT constructs and diet and physical activity in patients diagnosed with CHD are reviewed.

2.7.1 Natural experiments: studies of PMT in a community sample

The application of PMT to a wide range of health behaviours has been investigated using a cross-sectional design in community samples. Health behaviours include tooth brushing and flossing (Ronis, Antonakos, & Lang, 1996); breast self-examination (Hodgkins & Orbell, 1998); HIV prevention (Abraham, Sheeran, Abrams, & Spears, 1994; Bengel, Belzmerk, & Farin, 1996; Umeh, 2004); occupational health (Melamed, Rabinowitz, Feiner, Weisberg, & Ribak, 1996); and alcohol consumption (Ben-Ahron, White, & Phillips, 1995) amongst others. Two studies of particular interest to this thesis are studies that have utilised components of PMT, including cognitive appraisal of threat and coping responses specific to CHD, to explore behaviour aimed to prevent CHD (dietary fat consumption or physical activity) in a community sample (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995; Plotnikoff & Higginbotham, 2002). These studies are particularly interesting in that measures of both threat and coping appraisal focused on CHD. Findings from these two studies are summarised in Table 2.1. A later study by Plotnikoff and colleagues (Plotnikoff, Rhodes, & Trinh, 2009b) also used PMT to predict physical activity in a community sample, however, this later study did not measure both CHD specific threat and coping appraisal measures.
Plotnikoff and Higginbotham investigated the relationship between PMT variables and diet and exercise behaviour for the prevention of CHD (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995; Plotnikoff & Higginbotham, 2002). The study sample of Australian adults (N=800) was selected using the electoral role to ensure that the sample was representative of the community from which it was drawn. Participants’ mean age was 46 years. The PMT threat and coping appraisal constructs were measured using a structured interview. Dietary and physical activity intentions and behaviours were also assessed.

Looking first at their dietary fat model, a path analysis was conducted to determine the contribution of the PMT constructs to intended and actual dietary fat intake in this community sample (Plotnikoff & Higginbotham, 1995). Overall the PMT variables explained 39% of the variance in dietary fat intake behaviour. Coping appraisal variables (response efficacy and self efficacy) were both found to be related to low fat diet intentions, while self efficacy was also related to dietary fat intake behaviour. However while the threat appraisal variable of severity did not predict either low fat diet intentions nor behaviours in this sample, there was a negative association between vulnerability and dietary behaviour (Plotnikoff, 1994). This finding reflects findings from the meta-analysis reported previously (Floyd, et al., 2000), that is that the coping appraisal components of the model are the most important in the area of adherence to daily regimes.

A similar path analysis was conducted to determine the contribution of the PMT constructs to exercise intentions and exercise stage of change in the same sample (Plotnikoff & Higginbotham, 2002). Overall the model explained 53% of the variance in exercise intentions and 46% of the variance in exercise stage of change. The coping appraisal variable of self efficacy was found to be related to both exercise intentions and also exercise stage of change while response efficacy was not directly related to either exercise intentions or exercise stage of change. The threat appraisal variable of vulnerability was negatively related to both exercise intentions and stage of change while severity was positively related to exercise intention (Plotnikoff & Higginbotham, 2002).

Similarities and differences were evident in the behaviour of the two models. For both models, self efficacy was directly related to diet and exercise intention, dietary behaviour and exercise stage of change. However, response efficacy behaved differently across the models, with a direct relationship to intention only evident in the dietary model. The behaviour of the
threat appraisal variables differed across the two models. In the dietary fat model, severity was not directly related to intention or behaviour, while in the exercise model vulnerability and severity were both directly related to exercise intention and vulnerability was additionally related to exercise stage of change. Both models did however show a negative relationship between vulnerability and outcome measures. Comparison of the dietary and exercise models leads us to consider the prospect that PMT variables may operate differently in response to an identical threat (of CHD), depending on whether diet or exercise is investigated. While self efficacy was important for both models, response efficacy played a direct role in the dietary model only. In addition, the threat appraisal variable of severity was important in the exercise but not the dietary model. Interestingly, threat variables are evidently important in the exercise behaviour model in the healthy population, whilst the low fat diet model may have tempted us to discount the influence of these variables in this population group.

2.7.2 Natural experiments: studies of PMT in patient groups

Although PMT has been primarily applied in the field of primary prevention (Plotnikoff & Higginbotham, 2002), the model has also been successfully used as a framework for studies of adherence in patients with a chronic disease. It has been studied in the field of asthma (Boer & Seydel, 1996), insulin deficient diabetes mellitus (Bennett, Rowe, & Katz, 1998; Plotnikoff, Karunamuni, & Brunet, 2009a; Plotnikoff, Trinh, Courneya, Karunamuni, & Sigal, 2009c), rheumatoid arthritis (Palardy, Greening, Ott, Holderby, & Atchison, 1998), and Type 2 diabetes (Plotnikoff, et al., 2009a) as well as CHD (Godin, et al., 1991; Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, Reid, Slovinec D'Angelo, Plotnikoff, Morrina, Beatona, Papadakisa, & Pipe, 2009a).

It appears that the PMT model may behave differently depending on the patient group. In a study of asthma patients (N=71) threat appraisal was the most important predictor of adherence to medication (Bennett, et al., 1998), while in a study of patients with rheumatoid arthritis (Brus, van de Laar, Taal, Rasker, & Wiegman, 1999) the coping appraisal variable of self efficacy was the only predictor of compliance with a medication regime. A study of muscular dystrophy patients (Flynn, Lyman, & Prentice-Dunn, 1995) found that components of PMT appeared to operate differently in patient groups compared to those at risk of a disease. Given the difference in the behaviour of the PMT model depending on both the patient group and also the specific behaviour investigated, the findings from several studies which have
applied the PMT model to predict exercise or dietary behaviour in patients with CHD are of particular importance to this thesis (Godin, et al., 1991; Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, et al., 2009a). Of these, only Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) applied PMT to dietary behaviour in patients with CHD. The others applied PMT to exercise behaviour alone.

Findings from these studies are summarised in Table 2.1, along with experimental studies and population studies of PMT which have used CHD as the health threat. The study by Reid and colleagues (2007) and the study by Tulloch and colleagues (2007) use the same sample.

Godin and colleagues (Godin, et al., 1991) investigated the association between the threat appraisal components of PMT and exercise intention in a sample of patients who had experienced a STEMI (N=161). Participants’ mean age was 53 years. In this study, only the PMT threat appraisal components (perceived vulnerability and perceived severity) were included in the model. Results of this study showed that the addition of PMT threat appraisal components to the overall model did not increase the amount of variance explained in this patient group. These findings are consistent with the lesser importance of threat appraisal components of the model compared with coping appraisal components when adherence to demanding health behaviour regimes is investigated (Floyd, et al., 2000).
Table 2.1
Summary of relevant PMT literature: Response to CHD threat; significant relationships between PMT components and dietary fat or physical activity intention, stage of change or behavioural outcomes.

<table>
<thead>
<tr>
<th>Study type</th>
<th>Study authors</th>
<th>Population</th>
<th>Threat appraisal</th>
<th>Coping appraisal</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Severity</td>
<td>Vulnerability</td>
<td>Response efficacy</td>
</tr>
<tr>
<td>Experimental</td>
<td>Fruin et al., 1992</td>
<td>Students</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Stanley &amp; Maddux, 1986</td>
<td>Students</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Wurtele &amp; Maddux, 1987</td>
<td>Female students</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Correlational</td>
<td>Plotnikoff &amp; Higginbotham, 2002</td>
<td>Community</td>
<td>✓</td>
<td>✓(-ve)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Plotnikoff &amp; Higginbotham, 1995</td>
<td>Community</td>
<td>✓(-ve)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Correlational</td>
<td>Godin et al., 1991</td>
<td>CHD patients</td>
<td>NA</td>
<td>NA</td>
<td>✓</td>
</tr>
<tr>
<td>Prospective</td>
<td>Reid et al., 2007</td>
<td>CHD patients</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Tulloch et al., 2009</td>
<td>CHD patients</td>
<td>✓(I)</td>
<td>✓(I)</td>
<td>✓(I+B)</td>
</tr>
<tr>
<td></td>
<td>Blanchard et al., 2009</td>
<td>CHD patients</td>
<td>✓(I+B)</td>
<td>✓(I+B)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Plotnikoff &amp; Higginbotham, 1998</td>
<td>STEMI patients</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Plotnikoff &amp; Higginbotham, 1998</td>
<td>STEMI patients</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Note: Severity = perceived severity; Vulnerability = perceived vulnerability; NA = not applicable (PMT threat appraisal component not included in study); ✓=significant positive relationship between appraisal variable and outcome measure; ✓(-ve) = significant negative relationship between appraisal variable and outcome measure; ✓(I) = significant relationship with regression in stage of change from baseline maintenance stage over six months; ✓(I+B) = significant relationship with progression in stage of change from baseline contemplation/pre-contemplation stage over six months; ✓=significant relationship with intentions; ✓(I+B) = significant relationship with intentions and behaviour.
In a large prospective study, Robert Reid and colleagues (Reid, et al., 2007) investigated correlates of transition in exercise stage of change in patients with CHD. In this study 782 adults hospitalised with CHD were administered a baseline survey which assessed exercise stage of change and PMT constructs as well as constructs from a number of other models of behaviour change. Over one third (37%) of participating patients had had a PCI, with the remainder having experienced either a STEMI (36%) or undergone CABGS (27%). Patients were followed up six months after their cardiac hospitalisation and asked again about their exercise stage of change along with CR attendance. Patients were broadly classified as having either progressed or regressed in their exercise stage of change over the six months of the study. The PMT variables performed strongly as predictors of stage transition, with different components being related to stage transition depending on the patients’ initial exercise stage of change. Results showed that progression from pre-action stages over the six months of the study was associated with greater response efficacy. These findings are consistent with previous research that people were more likely to be motivated to exercise if they believed that such exercise could effectively reduce their risk of a specific disease (Courneya & Hellsten, 2001). Regression from action phases over the six months of the study was associated with increased levels of the PMT threat appraisal component of perceived vulnerability and reduced levels of the PMT coping appraisal component of self efficacy (Reid, et al., 2007a). This reduction in exercise stage of change amongst individuals who were previously active may represent a feeling of helplessness or hopelessness about the inevitability of the disease despite their previous health behaviour, and may represent maladaptive coping fostered by high levels of emotional arousal. Reid and colleagues (2007) recommends that individuals who are active at the time of hospitalisation for CHD should be counselled about their concerns in regard to recurrence of CHD.

A later paper from this research team (Tulloch et al., 2009), using the same large sample, examined the utility of PMT in the prediction of exercise intentions and behaviours over 12 months. In this longitudinal study, the authors found that the PMT model could be used to predict exercise intentions and behaviour six months after hospitalisation but was not reliable in the prediction of either intentions or behaviour 12 months after hospitalisation. In the six month data the model accounted for 23% of the variance. In this study, the coping appraisal variables were stronger predictors than threat appraisal variables. In addition severity, response efficacy and self efficacy were linked with exercise intentions, but only self efficacy was linked with
exercise behaviours. Perceived vulnerability was linked to neither exercise intentions nor behaviour in the study by Tulloch and colleagues (2009).

Blanchard and colleagues (Blanchard, et al., 2009) in a study of adherence to a home based exercise program in 76 patients with CHD, found that coping appraisal variables of response efficacy and self efficacy predicted exercise intention and behaviour while neither of the threat appraisal variables predicted intention to exercise nor exercise behaviour.

Plotnikoff and Higginbotham (1998) investigated both dietary and exercise behaviour in patients who had experienced a STEMI (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998). Participants were 152 hospitalised patients. Patients’ level of threat appraisal – perceived vulnerability and perceived severity – was collected in hospital. Six months after hospital discharge, patients completed a self report questionnaire to measure levels of PMT components (both threat and coping appraisal) as well as stage of change and intention to adopt a low fat diet and to undertake a regular exercise program. In addition a measure of dietary fat intake was also completed by participants. There was no measure of actual exercise behaviour. Overall, the model explained 46% of the variance in intention to adopt a low fat diet and 53% of the variance in intention to adopt a regular exercise regime (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998).

For the PMT dietary model six months after the cardiac event, self efficacy was strongly associated with patients’ low-fat diet intentions six month after their cardiac event (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) while response efficacy, was not directly associated with dietary intentions in this patient group. Interestingly, this finding runs counter to findings that response efficacy was predictive of dietary intentions in a community sample (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995). This may be due to a threshold effect in the patient group with a higher level of response efficacy in patients than in the population at large. Indeed the mean scores on the response efficacy items were higher for the patient group than in the community sample (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995). This higher level of response efficacy may result from the personalisation of the disease motivating both patients and their health professionals to increase the patient’s level of knowledge in terms of the efficacy of appropriate self-management behaviours.
Of the threat appraisal measures collected six months post cardiac event, vulnerability was linked to dietary stage of change. However there was no association between perceived severity and either dietary intentions or dietary stage of change.

The PMT model applied to exercise behaviour (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) was similar to the dietary model in that self efficacy, but not response efficacy, was significantly associated with intention. Threat appraisal was unrelated to intention to exercise, suggesting that threat appraisal may not be as relevant in the prediction of exercise behaviour as it is for dietary behaviour in the patient group. The role of threat appraisal in the prediction of dietary behaviour but not exercise behaviour runs counter to the findings from the community sample, where threat appraisal was predictive of exercise but not diet (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Plotnikoff & Higginbotham, 2002).

Overall, the Plotnikoff and Higginbotham study showed support for the self efficacy component of PMT when considering both exercise and dietary intentions, in patients with CHD. Interestingly, there was no association between baseline measures of vulnerability or severity with diet intentions or stage of change data collected six months after the cardiac event.

### 2.7.3 Summary of PMT diet and exercise studies in response to CHD threat

PMT contributes to understanding of the responses of both community samples and patient groups to the threat of CHD. Table 2.1 summarises the relevant literature which has utilised the PMT model to explore diet and exercise behaviour in response to the threat of CHD. Three types of studies, experimental, correlational and prospective, have been used to explore the utility of the PMT variables across sample groups. Self efficacy seems to be important in the prediction of both dietary and exercise behaviour in both community and patient groups in response to the threat of CHD as well as in the prediction of exercise behaviour in experimental studies which have used student samples. The other components of the model appear to behave differently in response to the threat of CHD depending on whether the sample was a patient group or not and on whether exercise or diet was investigated. Interestingly, threat appraisal predicts exercise but not dietary behaviour in healthy people, whereas in patients threat appraisal predicts diet but not exercise intention.

The study by Reid and colleagues (2007) may assist in understanding the underlying reasons for this divergence. High threat appraisal was associated with regression or reduced
exercise behaviour over time in a patient group. It appears that high levels of threat countered patients’ motivation to exercise. It might be that underlying beliefs held by patients about the severity of their disease (threat appraisal) and consequent anxiety about the potential dangers of exercise explain why the PMT model behaves differently in patient groups to the healthy population. This may help explain why threat appraisal was not positively associated with exercise intention or behaviour in patients who have had a cardiac event, even though threat variables are evidently important in the prediction of exercise behaviour in the healthy population (Plotnikoff & Higginbotham, 2002). Clearly something is happening within the patient group in addition to their immediate cognitive appraisal of threat and coping.

2.8 Impact of cardiac event

It is not surprising that severe symptoms (such as those experienced during an episode of ACS) and the diagnosis of serious disorders elicit strong emotional reactions. Such threats to health are related to the generation of strong emotional reactions (Leventhal & Cameron, 1987; Leventhal, Safer, & Panagis, 1983).

The emotional response of patients to the experience of CHD may help to explain differences in the patterns of association between PMT variables and health behavioural data when comparing patient and non-patient groups. The experience of patients with CHD, in regard to protection motivation would in all probability be vastly different from that of a community sample. Both depression and anxiety are more prevalent in patients with CHD than in the general population (Krantz & McCeney, 2002). It is clear that patients with CHD undergo significant trauma and distress. This psychological trauma that patients with CHD experience separates the attitudes of patients with CHD from those of the general community (Oldridge, Guyatt, Jones, Crowe, Singer, Feeny, McKelvie, Runions, Streiner, & Torrance, 1991). Patients who have been diagnosed with CHD experience a range of reactions to their cardiac event, including anxiety, depressed mood, adjustment difficulties, fear of further events, shock, confusion, and feelings of grief and loss. In particular, the period directly after hospitalisation for a cardiac event appears to be a period of significant trauma for many patients with CHD (Higgins, Murphy, Nicholas, Worcester, & Lindner, 2007). It is apparent that PCI patients are not immune from such emotional trauma. While patients experience significant improvements in both physical and emotional health following PCI (Tooth et al, 1997; Ben-Ari et al, 1989; White & Frasure-Smith, 1995;Faris & Stotts, 1990) the early improvements in
emotional status may not be maintained. An Australian study of emotional distress in 140 PCI patients has found that patients mean scores on depression at six months were actually significantly higher than mean scores at two months (Astin & Jones, 2004). Increases in depression over time in PCI patients could reflect patients’ struggle to manage their ongoing disease and the growing realisation that the PCI has not cured their CHD. It is apparent that the PCI procedure has emotional consequences.

Easterling and Leventhal (1989) reported that anxiety, fear, sadness and depression were important emotional reactions to disease. Evidence suggests that such negative emotional reactions to symptoms and diagnosis are associated with beneficial behavioural changes in the short term (Easterling & Leventhal, 1989; Millar & Millar, 1993) but also that such negative emotional states can have a detrimental effect on adherence to recommended health behaviours in the longer term (Carney, Freedland, Eisen, Rich, & Jaffe, 1995; Zeigelstein, Fauerbach, Stevens, Romanelli, Richter, & Bush, 2000). In the prediction of health behaviour change, patients’ emotional reactions to their cardiac event need to be considered in addition to the cognitive appraisals of the PMT model.

Many patients with CHD experience high levels of uncertainty and anxiety about their own mortality as patients adjust to the ongoing threat to mortality that the cardiac event represents (Higgins, et al., 2007; Mohan & Nirmala, 1987). Death anxiety in patients with CHD is mainly focused on the possibility of a future myocardial infarction (MI) and the treatability of their CHD and hence the prospect of surviving a future event (Mohan & Nirmala, 1987). Death anxiety has been described by patients as feeling “like you are living with a time bomb” (Higgins et al., 2007). Although levels of death anxiety in patients with PCI are unknown, ongoing anxiety at clinical levels is evident for a substantial number of PCI patients at six (Astin & Jones, 2004) and even twelve months (Edell-Gustafsson & Hetta, 2001) after the initial PCI. This anxiety could be related to patients’ beliefs about their mortality. A longitudinal study of 117 PCI patients which compared illness representations shortly after treatment with those of patients six to eight months later, found that over time patients’ perceptions of the chronicity and severity of their disease increased, while their feelings of personal control over their illness decreased over time (Astin & Jones, 2006). Such beliefs may affect health behaviours by engendering a feeling of hopelessness and helplessness in regards to the enormity of the threat that patients are facing.
2.9 The PMTplus model

The focus only on cognitive appraisals in the PMT model may limit the application of PMT to patient groups in general, and to patients with CHD in particular. While Rogers’ (1975) original PMT model included the emotional appraisal component of fear the extension of the PMT model into a PMTplus model (see figure 2.2) involved the broadening of Roger’s (1975) original concept of fear into the more general concept of emotional distress regarding a future cardiac event. This unique emotional distress variable included components of sadness and distress as well as anxiety as well as the fear component from Roger’s (1975) original model. The choice of these negative emotional appraisal items was based on the work of Easterling and Leventhal (1989) who proposed that distress, anxiety, fear and sadness directly influenced behaviours.

![Diagram of PMTplus model]

Figure 2.2 PMTplus model based on Basic Protection Motivation Theory model (Rogers & Prentice Dunn, 1997)
A further difference in the PMTplus model from Roger’s (1975) original PMT is the proposal that emotional appraisal directly influences intention along with the cognitive appraisal components of threat and coping. This is a major revision of Roger’s (1975) original model which conceptualised that fear influenced behaviour change indirectly through the cognitive appraisal component of severity (Rogers, 1975) rather than having a direct influence on intention. The direct influence of emotional appraisal in addition to cognitive appraisal may be required to more fully understand the behaviour choices of patients with CHD in response to the challenge of living with CHD. It is evident that patients who have a cardiac event go through significant trauma and may believe that they have suffered a significant threat to their own mortality. Such factors would presumably affect health behaviours. The inclusion of the broader emotional appraisal component of distress regarding a future cardiac event alongside PMT’s cognitive components might enrich the PMT model and extend the utility of this model in patient groups. Such a new PMTplus model might include the following variables: threat appraisal (severity and vulnerability); coping appraisal (response efficacy and self efficacy); and distress regarding a future MI; all of which might directly influence health behavior change.

The utility of an extended PMT model, known as the PMTplus model will be explored in the present thesis. The model will be used to understand the changes in the behaviour of PCI patients in terms of physical activity and eating behaviours. The use of the extended PMTplus model may increase the applicability of the PMT model to patients with CHD who have significant concerns about their future. These future concerns may affect behaviour choices alongside the cognitive appraisals of threat and coping included in Rogers original the PMT model.

2.10 Chapter summary

The development and testing of theoretical frameworks is crucial to the understanding of health behaviour change and the development of evidence-based interventions. However, in the area of CHD, most interventions have developed from a largely atheoretical base. Protection Motivation Theory (PMT) has a strong empirical base. The PMT model has been used to understand a wide range of health behaviours. PMT has the advantage over other theories of behaviour change in that it has been consistently subjected to experimental tests over the last two decades. This evidence along with the findings from two separate meta-analyses of PMT support the choice of PMT as the model of interest for this thesis.
The focus of PMT is on cognitive appraisals. The theory states that people make such appraisals in response to a threat. Threat appraisal comprises both perceived vulnerability and perceived severity. According to the theory, fear influences protection motivation indirectly by affecting perceived severity. Coping appraisal components of the model comprises both self efficacy and response efficacy. Two meta-analyses of PMT demonstrate strong evidence for this model. Both meta-analyses showed that all PMT variables correlate significantly with intention and behaviour, and that coping appraisal has a stronger relationship with intention and behaviour than threat appraisal. Interestingly the strongest association between coping appraisal and outcome measures was in the lifestyle behaviour area.

Three experimental studies using CHD as the threat condition demonstrated that the PMT coping appraisal variable of self efficacy was significantly related to both intention to exercise (Stanley & Maddux, 1986; Fruin et al., 1992; Wurtele & Maddux, 1987) and actual exercise behaviour (Fruin, et al., 1992). Response efficacy was independently associated with intention in one study (Stanley & Maddux, 1986) and interacted with self efficacy in another (Fruin, et al., 1992). Of the threat appraisal variables, perceived vulnerability was related to intention to exercise but not to exercise behaviour. Perceived vulnerability also appeared to interact with self efficacy (Wurtele & Maddux, 1987). Perceived severity was not significantly related to intention or behaviour in any of these three studies.

A number of studies have utilised PMT constructs to predict health related behaviours in natural experiments. Evidence from such studies indicates that PMT can contribute to the understanding of lifestyle behaviour decisions in response to the threat of CHD in both community and patient groups. It appears that when the threat of CHD is investigated the PMT model behaves differently in a patient sample to a community sample. The focus on cognitive appraisal may limit the application of PMT to patient groups in general and especially to patients with CHD especially. Notably, some patients with CHD have very high levels of death anxiety, characterised by concerns about the future. High levels of future concerns may affect health behaviours by engendering a feeling of hopelessness and helplessness in regards to the enormity of the threat to their very existence that patients with CHD are facing. The inclusion of future concerns as an extension of the PMT model into a PMTplus model might increase the relevance of the model to patient groups. The extended
PMTplus model will be utilised in the present thesis to explore changes in the behaviour of PCI patients.
3.1 Overview of the chapter

This chapter presents an integration of the literature reviewed in the previous chapters and rationale for the current study in section 3.2. The rationale for using a longitudinal research design is presented in section 3.3 followed by the general aims of the research outlined in section 3.4.

3.2 The problem

CHD is a serious health problem which places a considerable burden on individuals with this disease. Individuals with CHD are encouraged to manage their health behaviours in order to slow the progression of their CHD. Research has shown that patients with CHD who have had a PCI are less likely to comply with lifestyle recommendations and are also less likely to attend CR compared with other cardiac patients. These findings highlight the importance of gaining a more sophisticated understanding of this patient group, especially given the rapidly increasing number of patients treated with PCI. The choice of PCI patients as the population of interest for this thesis has also been influenced by the dearth of systematic research on the perceptions and health behaviours of PCI patients. An improved understanding of the factors that influence behaviour change in PCI patients may assist in the development of improved interventions to target secondary prevention of CHD in this population.

Much of the research investigating behaviour change in PCI patients has viewed PCI patients as a homogenous group. While commonalities exist within the treatment experience of PCI patients, it is clear that PCI patients differ markedly in terms of their disease experience. In many ways, the differences among PCI patients may hamper understanding of the impact of this minimal intervention on patients’ perceptions and health behaviours. Many studies in this area have included patients undergoing a first PCI, along with patients who may have had multiple revascularisations. No large studies have sought to tease out the impact of different disease experiences as precursors to the PCI intervention on patients’ perceptions and behaviours. Patients in the early stage of disease progression undergoing first PCI present an excellent opportunity for early intervention to reduce both morbidity and mortality through lifestyle change. It is this group of PCI patients who are of interest to this thesis. In the current study,
strict recruitment criteria was used to identify and recruit PCI patients in the early stage of disease progression.

It is clear that the development and testing of sound theoretical frameworks is crucial to the understanding of health behaviour change. In addition, the use of such frameworks can inform the development of interventions for specific patient groups. Despite this, there has been scant research which has systematically applied established psychological theories to understanding of health behaviour change in patients with CHD in general, let alone PCI patients. This atheoretical approach has limited understanding of behaviour change in patients after PCI. Such research could assist in the development of improved secondary prevention interventions for PCI patients. This is of particular importance, given the low levels of attendance of PCI patients at standard CR programs.

Protection Motivation Theory (PMT) is a well established psychological theory with a strong empirical base. PMT has been utilised to understand the responses of individuals to health threats. Overall, the strong evidence base for PMT supported the selection of PMT as the model of interest in this thesis. In addition, given the speculation in the research that PCI patients fail to change their health behaviour because of inadequate threat perception, this theory, which includes measures of threat perception, appeared particularly apt for the task of understanding PCI patients.

A number of studies have applied the PMT model to patients with CHD (Blanchard, et al., 2009; Godin, et al., 1991; Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, et al., 2009a). The present study has limited the population of interest to PCI patients undergoing a first revascularisation in order to better understand this expanding patient group. Of particular interest is the finding by Plotnikoff and Higginbotham (1998) that the PMT model behaved differently for dietary behaviour compared with exercise behaviour. This finding has informed the decision to include both dietary and exercise behaviour in the current study to further explore this perceived anomaly.

A finding that can be drawn from Plotnikoff and Higginbotham’s work (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995; Plotnikoff & Higginbotham, 1998; Plotnikoff & Higginbotham, 2002) is that the PMT model behaves differently in patient groups compared with a community sample. Of further interest was the finding in the study by Reid and colleagues (2007), that high threat appraisal was associated with reduction in exercise over time.
rather than increased physical activity as would be predicted by Rogers’ original model. Clearly something is happening within the patient group in addition to their immediate cognitive appraisal of threat and coping covered by the PMT model. A substantial body of evidence suggests that human behaviour is better understood if affective processes are taken into consideration in addition to cognitive beliefs (Millar & Tessar, 1986; Pfister & Bohm, 1992; Richard, van der Plight, & de Vries, 1995). Evidence presented in chapter 2 describes the traumatic effect of a cardiac event on many patients, particularly the issue of ongoing death anxiety. The struggles of patients to manage the implications of their disease may help to explain why the cognitively focused PMT model behaves differently in patient groups. The focus on cognitive appraisals in the PMT model may limit the application of PMT to patient groups in general and to patients with CHD in particular. The development of an extended PMT model may improve the predictive power of the PMT model in a patient group.

Extension of PMT into a PMTplus model which includes the emotional appraisal measure of distress regarding a future event may be required to more fully understand the behaviour choices of patients in response to the challenge of living with CHD. The use of PCI patients undergoing a first revascularisation to test this PMTplus model may be particularly appropriate. Patients at an early stage of their disease may have an even greater level of vulnerability, given that they are integrating substantial new information about their own mortality. The expansion of the PMT model to include distress regarding a future event would extend the literature in this area. Previous studies have relied on fear alone to measure emotional appraisal, rather that the broader concept of distress regarding a future event as proposed in the PMTplus model. In addition, this study proposes that the emotional appraisal component of the PMTplus model operates directly on behaviour change, not indirectly through intention as proposed by Rogers (1975). The inclusion of diagnostic group and cardiac rehabilitation attendance in the patient characteristics will allow investigation of the impact of these factors on PMTplus model variables and on health behaviours. Findings from this study, in addition to extending research in this area, may also assist health professionals in the practical task of the development and social marketing of specific health education interventions for both dietary and exercise behaviours targeted at PCI patients.
3.3 Longitudinal and cross-sectional research into theories of behaviour change

Longitudinal research has rarely been undertaken with PCI patients in the area of behaviour change. Research to date in this area has been largely cross-sectional with data usually collected shortly after the PCI procedure. In the few studies with longitudinal data it is clear that PCI patients undergo change over time as they adjust to their illness, with changes evident in illness perceptions (Astin & Jones, 2006), health behaviours (Reid et al., 2006) and emotional distress (Astin, Jones, & Thompson, 2005). Given that neither health behaviours nor attitudes appear to remain stable within this patient group, cross-sectional studies enable only limited understanding of the impact of undergoing PCI. Longitudinal data is required to assist in understanding patients’ adjustment to their disease over time. It is likely that cognitive and emotional appraisals, included in the PMTplus model, might also change over time as patients adjust to the challenge of living with their CHD. In particular, given that the patients under investigation in this study were in the early stage of disease progression. Such patients would, presumably, undergo a considerable process of adjustment in order to come to terms with living with their disease.

In addition, theoretical considerations for the testing of a model of behaviour change would also benefit from a longitudinal approach. To date, much of the evidence for the applicability of models of behaviour change has been tested solely using cross-sectional data collected at a single time-point. This is an erroneous approach that leads to an overestimation of the accuracy of the theories that are being evaluated (Weinstein, 2007). Weinstein and colleagues (2007) argue that biases introduced by the use of cross-sectional data were particularly strong when dietary or physical activity health behaviours are assessed due to the repetitive nature of such behaviour in study participants. In addition, where longitudinal data has been used, static modeling of behaviour is mostly used, whereby individual differences in predictor variables at a previous time-point are used to predict differences in behaviour at a later time-point (Sutton, 2004). In light of these considerations, a longitudinal design was used in the current study. Rather than use static modeling, the approach adopted in the current thesis has been to identify how changes in predictor variables were associated with changes in outcome health behaviours. In essence, the current study has used change in PMTplus variables to predict change in health behaviours. This is similar to the approach taken by Scholz and colleagues (Scholz, Nagy, Goehner, Luszczynska, & Kliegel, 2009) who examined how changes in
predictor variables influenced changes in outcome health behaviours. In view of the limited, longitudinal data available on this population, it is hoped that the data collected in this study will make a contribution to the literature in this area and that the testing of the PMTplus model will enable a greater understanding of behaviour change in PCI patients.

3.4 Aims of the current study and research questions

There were two major aims of the current study. The first aim of the research was to examine changes over six months in health behaviours, cognitive appraisals and emotional appraisals in patients undergoing a first PCI. Four research questions were addressed:

i) Are there changes in cognitive appraisals and emotional appraisal over the six months following PCI in patients undergoing a first revascularisation procedure?

ii) Are there changes in saturated fat intake and walking frequency over the six months following PCI in patients undergoing a first revascularisation procedure?

iii) Does diagnostic group or CR program attendance influence change over the six months in cognitive appraisal and emotional appraisal following PCI in patients undergoing a first revascularisation procedure?

iv) Does diagnostic group or CR program attendance influence change over six months in saturated fat intake and walking frequency following PCI in patients undergoing a first revascularisation procedure?

The second aim of the research was to test the utility of the PMTplus model to predict lifestyle change over six months in PCI patients undergoing a first revascularisation procedure. Three research questions were addressed. These were:

i) Change over time in what PMTplus factors predicts change over time in walking episodes following PCI, in patients undergoing a first revascularisation procedure?

ii) Change over time in what PMTplus factors predicts change over time in saturated fat intake, following PCI, in patients undergoing a first revascularisation procedure?

iii) Does the addition of an emotional appraisal measure to the PMT model, result in improved prediction of change over time in saturated fat intake and weekly walking episodes following PCI, in patients undergoing a first revascularisation procedure?
Chapter 4  METHOD

4.1  Overview of the chapter

This chapter offers a detailed description of the methodology used in this study. Section 4.2 outlines the study population, including eligibility criteria. Section 4.3 covers exclusions and withdrawals, while section 4.4 describes the characteristics of the sample. The procedure is described in section 4.5. Section 4.6 covers the items used to measure medical, sociodemographic and impact of event variables at Time one (T1), shortly after PCI. Section 4.7 covers the measurement of PMTplus components at both T1 and Time two (T2), six months after the initial interview. Finally, section 4.8 covers the measurement of health behaviours at both T1 and T2.

4.2  Study population and eligibility criteria

Eligible patients were those consecutively admitted for first PCI at one of three metropolitan hospitals in metropolitan Melbourne, Victoria. Ethics approval was granted by the Mental Health Research and Ethics Committee for research conducted at Melbourne Private Hospital and Royal Melbourne Hospital. St. Vincent’s Health Human Research Ethics Committee granted ethical approval for research conducted at St. Vincent’s Hospital. (Ethical approval documentation is included in Appendix I). Daily lists of all patients scheduled for PCI between 9 November 2000 and 15 January 2002 were perused in order to identify patients who had been treated with a PCI. In order to recruit patients at an early stage of their disease progression, patients were deemed ineligible if they were aged 75 years or more, had previously undergone cardiac surgery or earlier PCI or if they had had an STEMI more than six months prior to their PCI. Patients were also ineligible if they had serious physical or psychiatric illness or a drug or alcohol related addiction. After initial checks of medical records to determine eligibility, PCI patients were personally approached in hospital after their procedure and invited to participate in the study. Patients were excluded if they were unable to participate in the telephone interview due to an insufficient command of English, hearing impairment, lack of a telephone or unavailability for the two telephone interviews, the first to be administered shortly after discharge (T1) and the second six months after hospital discharge (T2). At recruitment, prior to the telephone interview at T1, patients were given a written explanation of the study
procedures (Appendix II) and convenient times and dates for interview were discussed. Informed consent (Appendix III) was obtained at recruitment, along with contact details to facilitate the telephone interviews.

Included patients were classified into one of three diagnostic groups, acute coronary syndrome (including Non-STEMI and STEMI) and stable angina (SA). The STEMI group had experienced a STEMI within six months prior to the PCI, defined by the presence of ST elevation denoting a transmural infarct. The non-STEMI group had required admission to an emergency department with non-STEMI within the six months prior to the PCI. The stable angina (SA) group consisted of those patients diagnosed with stable angina (i.e. predictable angina on exertion). A stratified recruitment technique was employed. Participants were consecutively admitted to the study until each of the comparison groups was full. Once a group was full, recruitment targeted the remaining groups.

4.3 Exclusions and withdrawals

There were 469 patients eligible for the study. Of these, 175 (37%) were excluded, mostly because of insufficient English (46%) or early discharge precluded recruitment in hospital (20%; see Table 4.1). Of the 294 who consented to participate in the study, 76 (26%) withdrew before the baseline interview. The most common reasons for withdrawal were failure of the researcher to make telephone contact after discharge, despite numerous attempts (42%), and acute physical illness that precluded participation in the study (21%; Table 1). One-way ANOVA showed no differences in the age of those who participated or withdrew ($F = .263, df = 1, p = .609$); chi-square analyses showed no differences in the gender of those who participated or withdrew ($\chi^2 = 1.447, df = 1, p = .143$). As shown in Table 4.1, a further 18 patients (6%) withdrew from the study between baseline and six months because the researcher was unable to make contact in order to conduct a follow up interview (eleven patients), physical illness precluding interview (four) or refusal (three).
Table 4.1  Reasons for exclusion and withdrawal

<table>
<thead>
<tr>
<th>Reason</th>
<th>Exclusion (n = 175)</th>
<th>Withdrawal (n=76)</th>
<th>Withdrawal 6 months (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Insufficient English</td>
<td>80 (46)</td>
<td>11 (14)</td>
<td>--</td>
</tr>
<tr>
<td>Failed contact</td>
<td>35 (20)</td>
<td>32 (42)</td>
<td>11 (61)</td>
</tr>
<tr>
<td>Significant co-morbidity(^a)</td>
<td>20 (11)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Acute physical illness(^b)</td>
<td>--</td>
<td>16 (21)</td>
<td>4 (22)</td>
</tr>
<tr>
<td>Refusal</td>
<td>18 (10)</td>
<td>11 (14)</td>
<td>3 (17)</td>
</tr>
<tr>
<td>Unavailable for follow-up</td>
<td>8 (5)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Hearing impairment(^c)</td>
<td>7 (4)</td>
<td>4 (5)</td>
<td>--</td>
</tr>
<tr>
<td>Other disability or impairment(^d)</td>
<td>7 (4)</td>
<td>2 (3)</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: \(^a\) Includes illnesses such as cancer and chronic kidney disease; \(^b\) Illness that caused patients to feel unwell and precluded participation in the study such as a transient viral or bacterial infection; \(^c\) Includes hearing impairment to a level that interfered with conduct of the telephone interview; \(^d\) Includes cognitive impairment and psychiatric disability.

4.4  Sample descriptives

Patient characteristics are shown in Table 4.2. Of the 218 PCI patients included in the study, ages ranged from 33 to 74, with a mean age of 59 years (SD ±10.3 years). Just over half of patients were aged 60 years or more (110, 51%). A fairly low level of education was evident; the mean school leaving age of the sample was 15 years (SD ± 1.8 years). The emotional impact of the event was rated as fairly low, with a mean score of 2 (SD ± .88) out of a possible scale range of 5. More than three quarters of patients were male (164, 76%). The majority of patients were partnered and a slight majority were in blue collar occupations as classified by the Australian Standard Classification of Occupation (ASCO) guidelines (Australian Bureau of Statistics, 1997).
### Table 4.2 Characteristics of the sample

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>164</td>
<td>76</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>24</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 60 years</td>
<td>106</td>
<td>49</td>
</tr>
<tr>
<td>60 - 74 years</td>
<td>110</td>
<td>51</td>
</tr>
<tr>
<td><strong>Occupational group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue collar</td>
<td>114</td>
<td>53</td>
</tr>
<tr>
<td>White collar</td>
<td>100</td>
<td>47</td>
</tr>
<tr>
<td><strong>School leaving age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left school ≤15 years</td>
<td>111</td>
<td>51</td>
</tr>
<tr>
<td>Left school &gt;15 years</td>
<td>107</td>
<td>49</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or de facto relationship</td>
<td>174</td>
<td>80</td>
</tr>
<tr>
<td>Not married or non de facto relationship</td>
<td>44</td>
<td>20</td>
</tr>
<tr>
<td><strong>Diagnostic group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEMI</td>
<td>83</td>
<td>38</td>
</tr>
<tr>
<td>Non-STEMI</td>
<td>60</td>
<td>28</td>
</tr>
<tr>
<td>SA</td>
<td>74</td>
<td>34</td>
</tr>
<tr>
<td><strong>Painfulness of event</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimal to moderate</td>
<td>104</td>
<td>48</td>
</tr>
<tr>
<td>Extreme pain</td>
<td>112</td>
<td>52</td>
</tr>
</tbody>
</table>

Note: N = 218; STEMI = ST elevated myocardial infarction <6 months prior to PCI; Non-STEMI = one or more episodes of diagnosed non-STEMI requiring hospital admission 6 months prior to PCI; SA = history of stable angina in six months prior to PCI; Blue collar = last paid employment in a blue collar occupation as defined by ASCO guidelines; White collar = last employment in a white collar job as defined by ASCO guidelines.

In total, data on CR attendance was available for 204 patients. Well over half, 121(60%) attended at least one session of CR and less than half, 83(40%) did not attend any CR sessions. Attendance was defined as having attended at least one session of CR, in line with other studies in this area (Worcester, et al., 2004).
4.5 Procedure

Structured telephone interviews were conducted with 218 patients at Time one (T1), shortly after discharge from hospital (11±6 days). Follow-up telephone interviews were conducted at Time two (T2) with 200 patients approximately six months after hospital discharge (183±12 days). The duration of the telephone interviews was approximately 40 minutes. The complete questionnaire administered at T1 is included in Appendix IV followed by the complete questionnaire administered at T2 in Appendix V.

4.6 Baseline: medical, sociodemographic and impact of cardiac event variables

Medical and sociodemographic characteristics as well as impact of cardiac event measures were collected at T1 only.

4.6.1 Baseline medical and sociodemographic variables

Data on diagnostic group, age and gender were collected from the medical records at recruitment. Further sociodemographic characteristics were collected at the first telephone interview (T1), conducted shortly after hospital discharge. Sociodemographic data collected from the patient included: occupation group (Australian Standard Classification of Occupation level 1-8 (Australian Bureau of Statistics, 1997); school leaving age and marital status (married including de facto relationships / not married or not in a de facto relationship). Impact of the cardiac event data (emotional impact and pain of event) were also collected at T1. Number of days elapsed between procedure and interview was calculated at the time of the interview. Inclusion or withdrawal status was recorded as required.

Attendance at a CR program after hospital discharge was investigated by self-report collected at T2, six months after the cardiac event. Exact number of sessions attended was not obtained. Consistent with previous studies (Worcester et al, 2004), patients were classified as rehabilitation attenders if they claimed that they had attended at least one session of a CR program in the six months following their cardiac event.

4.6.2 Baseline impact of cardiac event variables

Two measures of the specific impact of the cardiac event were developed to measure the level of pain experienced during the cardiac event and the patients’ emotional response to the
event, specifically to both symptoms and diagnosis. Both these items were administered only at T1 when the impact of the event would have been most salient.

The level of pain experienced during the cardiac event was measured with an item specifically developed for this study ‘How painful were the worst of your chest pains?’ Respondents were asked to rate the painfulness of their cardiac event on a six-point Likert scale. Possible responses for the Likert scale ranged from ‘More pain than I ever felt’ (6) to ‘No symptoms at all’ (1). While this item had high face validity, Cronbach’s Alpha could not be calculates for this single item measure.

Emotional impact of the event was assessed using eight items which addressed patients’ feelings of upset, anxiety, fear and depression in reaction to symptoms and diagnosis for the patient who had had the event preceding their admission to hospital for PCI. The emotional impact of cardiac event scale developed for the current study was an eight item scale developed from a single item used in a previous study (Leventhal & Cameron, 1987) addressing fear in reaction to symptoms. Feelings of upset, anxiety, fear and depression were included to match the normal emotional reactions to chronic illness proposed by Easterling and Leventhal (1989)

Patients were asked about their emotional response during the presence of symptoms and also at the time of diagnosis. Four questions addressed emotional impact of symptoms and four addressed emotional impact to diagnosis. For all eight items responses were recorded on a five-point Likert scale ranging from 1 to 5. Responses to these items ranged from 1= ‘Not frightened (upset/anxious/depressed) at all’ to 5= ‘More frightened (upset/anxious/depressed) than I have ever felt.’ Full details of the eight items contained in the emotional impact of cardiac event scale can be viewed in Appendix VI, along with response options for these questions. The emotional impact of cardiac event total score was calculated by summing scores on all eight emotion items and calculating a mean emotional impact of cardiac event score for each patient. Basing the scale on Easterling and Leventhal’s (1989) previous work has provided this measure with a reasonable level of construct validity. In addition, the internal consistency of this scale was very good with a Cronbach Alpha of .86. Unfortunately test retest reliability could not be calculated as this item was measured at one time point only.
4.7 Time 1 and Time 2: measurement of PMTplus components

All PMTplus scales were administered at both time-points; T1, shortly after discharge and T2, six months after discharge. Behavioural measures were also collected at both T1 and T2 for the two behaviours of interest, walking and saturated fat intake.

4.7.1 PMT threat appraisal variables

Measures of perceived severity and perceived vulnerability were developed for this study, based on previous studies in this area. Severity has been measured differently in separate studies which have applied PMT to patients with CHD, for example while Plotnikoff and Higginbotham (1998) measured perceived severity of the existing heart problem Godin and colleagues (1991) measured perceived severity of a future MI. The measure of the threat of future disease used by Godin and colleagues was more closely aligned with Roger’s model of protection motivation as a response to a future threat (Rogers, 1983) than the measure used by Plotnikoff and Higginbotham (1998). Given these considerations, it was decided that the present study would measure severity using an adapted version of the single item measure used in the Plotnikoff and Higginbotham study, with the threatened outcome changed from current heart problems to the threat of a future MI so the item was more aligned with the PMT model of future threat.

The single item measure of severity used in the Plotnikoff and Higginbotham (1998) study was, “How serious do you think your heart problem is?” Respondents were asked to rate severity on a five-point Likert scale. Possible responses for the Likert scale ranged from “Not at all serious” (1) to “Very serious” (5). Item test retest reliability was very good with a correlation between baseline and six month scores of 0.83 in the Plotnikoff and Higginbotham (1998) study. In the current study the item was adapted to “How serious would it be if you had a/another heart attack?” In order to reduce the ceiling effect evident in PMT severity measures (Plotnikoff & Higginbotham, 1998) an additional point was added to the Likert scale measuring severity, with possible responses on the six-point Likert scale ranging from “Not serious at all” (1) to “The most serious event imaginable” (6). This approach of adding extra Likert scale points to reduce ceiling effects in PMT severity measures was also used by Tulloch and colleagues (Tulloch, et al., 2009a). Although single items have been widely used to measure
threat appraisal (Norman et al., 2005), multiple items are usually preferable. However additional items were not added due to limitations in the length of the interview schedule. Plotnikoff and Higginbotham (1998) noted a high level of correlation between single item measures of threat appraisal and valid scales with multiple items.

Perceived vulnerability is generally defined as a conditional risk estimate, that is, the probability that a threatened outcome will occur if no action is taken to reduce risk (Beck & Frankel, 1981; Rogers, 1975; Sutton, 1982). However, much of the research testing PMT has operationalised perceived vulnerability in terms of an unconditional risk estimate, where the factors taken into account by participants, when making the risk estimate, were not specified (e.g. Plotnikoff & Higginbotham, 1998). In the current study, perceived vulnerability was measured using a conditional risk estimate of patients’ perception of the probability of disease progression if preventive action were not taken. This measure of perceived vulnerability adheres closely to Roger’s (1975) original definition of perceived vulnerability. In addition, conditional risk estimates seem to be more stable than unconditional risk estimates in the prediction of behavioural intentions (van der Velde, Hooykaas, & van der Pligt, 1996).

The measures of perceived vulnerability used in this study were adapted from work by van der Velde and colleagues (1996). The original question used by van der Velde and colleagues (1996) was “How do you estimate the chance that that you were become infected with the AIDS virus, in the next two years, if you do not use condoms?”. This measure was expanded from the single item used by van der Velde and colleagues (1996) to four items for the present study whereby patients were asked to estimate their conditional vulnerability to a future heart attack and to any other kind of heart trouble on the basis of a lack of preventive action in three areas: regular physical activity; saturated fat intake and lifestyle change. Two, three-item vulnerability scales were developed from these four questions; a physical activity vulnerability scale and a dietary vulnerability scale. Details of items within each scale can be seen in Appendix VI.

Response options in the current study were identical to those used by van der Velde and colleagues (van der Velde, et al., 1996). Patients were asked to rate their perceived level of likelihood of a heart attack or heart trouble in the future. Five levels of risk assessment were possible (0%, 25%, 50%, 75%, and 100%). Items were reverse coded prior to scale construction; higher scores represented greater perceived vulnerability. The physical activity and the dietary
vulnerability total scores were calculated by summing scores on all three items and calculating mean dietary and physical activity vulnerability score for each patient.

4.7.2 PMT coping appraisal scales

Survey items to measure both physical activity and dietary response efficacy and physical activity and dietary self efficacy were taken from a questionnaire by Plotnikoff and Higginbotham (1998), previously validated in a study of cardiac patients. The physical activity and dietary fat response efficacy scales devised by Plotnikoff and Higginbotham (1998) consisted of seven and five items respectively. Unfortunately, due to the need to reduce participant burden, the complete scales could not be included in the current study. The need to reduce participant burden was due to the lengthy nature of the survey and the fact that the survey was administered to patients by telephone, shortly after hospital discharge. Two general items from the scales devised by Plotnikoff and Higginbotham (1998) were included in this study to measure response efficacy, one to measure physical activity response efficacy ‘How much do you think that sticking to a regular exercise program would reduce the chances of you having a/another heart attack?’ and the other to measure dietary response efficacy ‘How much do you think that sticking to a low fat diet would reduce the chances of you having a/another heart attack?’ These single items measures of physical activity and dietary response efficacy in the current study were similar to items used in many other PMT studies (Houlding & Davidson, 2003; Rippetoe & Rogers, 1987). Specific item wording for both the physical activity response efficacy and dietary response efficacy one item scales is shown in Appendix VI.

Response options were identical to those used by van der Velde and colleagues (1996). Patients were asked to rate their reduced risk of a heart attack if they followed the recommended behaviours. Five levels of risk reduction were possible with increments of 25 percent in estimated probability (0%, 25%, 50%, 75% and 100%). Items were reverse coded prior to analysis; high levels on these variables represented greater response efficacy.

Items to measure dietary and physical activity self efficacy were taken from a scale developed by Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) in a study of Australian cardiac patients. These dietary and physical activity self efficacy scales consisted of five and seven items respectively. Unfortunately all items from the two self efficacy scales could not be included in the questionnaire, due to the need to consider participant burden for the reasons outlined above. Four out of the five items in the Plotnikoff and Higginbotham
dietary self efficacy scale were utilised to measure dietary self efficacy in this study. The included items had the highest loading on dietary self efficacy in the factor analysis conducted by Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998). The specific items included in the dietary self efficacy scale are shown in Appendix VI.

Response options in the current scale were identical to the five-point Likert scale used in the Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) study. They ranged from “Not confident at all” (1) to “Absolutely confident” (5). The dietary self efficacy total score for this study was calculated by summing scores on all four dietary self efficacy items and calculating a mean dietary self efficacy score for each patient. The mean dietary self efficacy score on the original Plotnikoff (1994) dietary self efficacy scale was 4.3 ($SD=.71$) in a sample of 145 cardiac patients.

The discrimination index for the Plotnikoff dietary self efficacy scale was very good with $\delta = 0.87$ (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998). The two reliability measures for this scale reported by Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) demonstrated a high level of reliability. There was a fairly high level of internal consistency ($\alpha = .88$). Test retest reliability was also assessed in a subsample of 37 patients, with results showing a high level of reliability on this dimension as well ($r=.78$, $p\leq .001$).

In this study physical activity self efficacy was measured using five out of the seven items from the Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) physical activity self efficacy scale. All seven items loaded highly on physical activity self efficacy on the factor analysis conducted by Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998), with loadings ranging between .75 and .85. The two items with the lowest face validity for the sample of PCI patients were excluded; these two items dealt with the patient feeling either sick or tired. The remaining five items were included. The five items from the Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) study that were used to measure physical activity self efficacy are shown in Appendix VI.

Response options for the physical activity self efficacy scale in the current study were identical to the five-point Likert scale used in the Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) study, ranging from “Not confident at all” (1) to
“Absolutely confident” (5). The physical activity self efficacy total score for this study was calculated by summing scores on all five items and calculating a mean physical activity self efficacy score for each patient. The mean score on the original scale developed by Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) was 4.22 (SD=.65) in a sample of 118 cardiac patients.

The discrimination index for the original physical activity self efficacy scale (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) was very good (δ = 0.94.) The two reliability measures for this scale reported by Plotnikoff and Higginbotham (1998) demonstrated a high level of reliability. A high level of internal consistency was demonstrated with a Cronbach’s alpha of .91 and test retest reliability, assessed in a subsample of 37 patients, showed a high level of reliability on this dimension as well (r=.77, p≤.001).

4.7.3 Future distress

The future distress scale was developed as an extension of the single item measure of fear arousal utilised by Plotnikoff and Higginbotham (1995). The original item used by Plotnikoff and Higginbotham (1995) asked patients “Tell me how frightened you feel when you think about the possibility of having further heart problems”. This item had a test retest reliability coefficient of .80 in cardiac patients over a six month time interval (Plotnikoff, 1994). Three additional items were developed for this study, based on this fear arousal item. The additional items measured anxiety, upset and depression in relation to further heart problems. Feelings of upset, anxiety, fear and depression were included to match the normal reactions to chronic illness proposed by Easterling and Leventhal (1989). The word ‘frightened’ in the original (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995) item was replaced with anxiety, upset and depression to develop three additional items to measure emotional reactions in response to thoughts of future heart problems. Details of the four future distress items that comprise the future distress scale are shown in Appendix VI.

Due to the use of telephone interviewing, a Likert scale response format was used rather than the visual analogue scale used by Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998). The end-points of the five-point Likert scale, were identical to the end-points used in Plotnikoff and Higginbotham’s (1995) visual analogue scale. These ranged from “Not at all frightened (upset/anxious/depressed)” (1) to “The most frightened
(upset/anxious/depressed) possible” (5). The future distress total score was calculated by summing scores on the four items and calculating a mean future distress score for each patient.

4.8 Time 1 and Time 2: health behaviours

Physical activity patterns were assessed subjectively using a single-item question. This approach was considered to be more practical in terms of study cost and participator convenience than objective measures such as heart rate monitoring, graded exercise testing or pedometer recordings. Estimates using this subjective approach are common in epidemiological studies and are valuable, in relative terms, in ranking individuals or groups of subjects within a population from the least to most active (Oldridge, et al., 1991).

In the current study, walking was chosen as the behaviour of interest. It is current practice to encourage cardiac patients to commence a walking program as soon as possible after hospital discharge (Goble & Worcester, 1999). The National Heart Foundation of Australia (National Heart Foundation of Australia., 2007) recommends that individuals with CHD, progress over time to the recommended goal of at least thirty minutes of moderate intensity physical activity (such as walking) on most days of the week. In this study, physical activity patterns were examined by determining the number of times the patient walked for at least twenty minutes in a week. Questions about walking within the past week is an approach which is used in other assessment tools such as the Seven-Day Physical Activity Recall questionnaire used in the Stanford Five-City Project (Sallis, Haskell, Wood et al., 1985); the YALE Physical Activity Survey (Dipietro, Caspersen, Ostfeld & Nadel 1993) and the Physical Activity Questionnaires of the Kuopio Ischemic Heart Disease Study (Lakka & Salonen 1993). Surveys with short time frames such as seven days have the advantage over longer time frame surveys in providing estimates that are less vulnerable to recall bias and are easier to validate with objective methods (Kriska & Caspersen, 1997). However, for the baseline measure where hospitalisation and symptoms may have affected the participants’ usual level of physical activity, participants were asked to recall their usual level of physical activity before they had their PCI.

The walking item was modified from the 1999 National Physical Activity Survey (Armstrong, et al., 2000). Bauman (Bauman, 1998) found that these single item questions have strong correlations (ranging from .86 to.95) with longer questionnaires providing specific activities estimates. The 1999 National Physical Activity Survey (Armstrong, et al., 2000) included an item about walking for 20 minutes or more. It was felt that this item best reflected
the current National Heart Foundation recommendations (National Heart Foundation of Australia, 2007). The original item from the 1999 National Physical Activity Survey (Armstrong, et al., 2000) was ‘How many times would you have walked for 20 minutes or longer during an average week?’ In the current study, this item was adapted at baseline to include the period prior to hospitalisation as a reference point. The revised baseline question was ‘Before you had your PCI, “How many times would you have walked for 20 minutes or longer during an average week? When you answer, please think about things such as walking to work, to the shops or to a bus stop.’ At six months the question was identical to that used in the 1999 National Physical Activity Survey (Armstrong, et al., 2000). ‘How many times would you have walked for 20 minutes or longer during an average week?’

Dietary fat intake was measured using items from the Short Fat Questionnaire (SFQ) (Dobson, Blijlevens, Alexander, Croce, Heller, Higginbotham, Pike, Plotnikoff, Russell, & Walker, 1993). The SFQ is a 17 item, Australian scale designed to measure habitual food consumption. The SFQ asks about consumption of specific high fat food items during an ordinary week. Response options are never, less than once (in a week), once or twice, three to five times and six or more times. Dobson and colleagues (Dobson, et al., 1993) demonstrated that the scale has a test retest reliability correlation of 0.85 over a seven to nine-month period and correlations of between 0.44 and 0.54 with the dietary fat measures of the considerably more demanding CSIRO food frequency questionnaire (Lassale, Guilbert, Keogh, Syrette, Lange, & Cox, 2009).

The SFQ is a reliable, short measure of dietary fat intake, however, the instrument is limited in its usefulness for patients with CHD as the instrument includes both saturated fats and unsaturated fats. Patients with CHD are advised to avoid saturated fat consumption as part of the cardiac diet, however, the advice on unsaturated fat consumption is less restrictive with the consumption of some unsaturated fats actively encouraged (National Heart Foundation of Australia, 1999). As a consequence of this, only the eight items from the original SFQ which were specific to saturated fat consumption were included in the current study. The selected items dealt with the habitual consumption of the following foods: gravy; cream or cheese sauces; sausages, devon or salami; meat pies, hamburgers or bacon; chips or french fries; pastries, cakes, sweet biscuits or croissants; potato crisps or corn chips; ice cream; cheddar, edam or other hard cheese, cream cheese or soft cheese such as camembert; and full cream milk. The specific SFQ
items used in the current study, along with response options, can be seen in Appendix VI. The saturated fat intake total score was calculated by summing scores on all eight items and calculating a mean saturated fat intake score for each patient.
Chapter 5 RESULTS

5.1 Overview of the chapter

The results of the current study are presented in this chapter. Issues pertinent to data screening are dealt with in section 5.2. Section 5.3 covers scale properties and sample means at Time one (T1) while section 5.4 covers scale properties and sample means at Time two (T2), six months after PCI. Section 5.5 presents the results of three-way ANOVAs investigating the influence of change over time, CR attendance and diagnostic group. Correlations between variables are presented in section 5.6. Section 5.7 reports on the calculation of difference scores and the relationships between change scores. Section 5.8 presents the results of the multiple regression analysis for the outcome measure of walking frequency. Finally, section 5.9 shows the results of the multiple regression analysis for the outcome measure of saturated fat intake.

5.2 Data screening

The data were examined by checking all cases to determine the extent of missing data. One case had more than 30% missing, a level which would jeopardise meaningful interpretation (Tabachnik & Fidell, 1996). This case was excluded from the data set, bringing the number of participants at T1 down to 217.

Many statistical techniques, including multiple regression analysis, are sensitive to the presence of outliers. Outliers extend more than 1.5 box-lengths from the edge of the box plot; extreme outliers are defined as extreme points that extend more than three box plot lengths from the edge of the box plot (Pallant, 2001). Options for dealing with outliers include retaining the case with the outlier unchanged in the data base, changing the outlier value to a less extreme value or deleting cases containing extreme outliers from the data file (Tabachnick & Fidell, 2007).

Data screening revealed one extreme univariate outlier in the variable measuring number of walking episodes at T1 using SPSS box plots. After checking the original questionnaires to ensure that this extreme value did not reflect a problem with data entry, the case was eliminated from the analysis bringing the total sample at T1 to 216. There were no extreme univariate outliers at T2. The walking episodes variable was the only variable in the data set that allowed a
response along a scale with no specified end-point. All other variables were measured using Likert scales. Outliers were not detected for any other variables.

Checks were also performed to determine the presence of any multivariate outliers. These outliers are cases with an unusual combination of values on the dependent variables. The calculation of Mahalanobis distance revealed no significant multivariate outliers.

5.2.1 Distribution of data

Histograms (see Appendix VII) of the two outcome measures of walking and saturated fat consumption were used to examine the distribution of these variables at both T1 and T2. The histograms for T1 and T2 walking data showed a bimodal distribution, with peaks at zero (no walking) and seven (daily walking) walking episodes per week. Such data appear to accurately represent the walking habits of the participants, rather than being an artefact of the measuring device. Tabachnik and Fiddell (2007) state that in reasonably large samples of greater than 200 cases, neither skewness nor kurtosis make a substantive difference in the analysis. Given the number of cases in the data set and the ecological validity of the bimodal distribution, it was decided not to transform the data. In order to control for an individual’s level of walking at T1, a difference score was created (Liang & Zeger, 2000). This variable was calculated by the subtraction of the number of walking episodes of an individual at T1 from their number of walking episodes at T2. When the histogram of the difference score in walking over time (T2-T1) was examined, the distribution reflected a normal distribution without bimodal peaks (see Appendix VII).

The histograms for the distribution of saturated fat consumption at T1 and T2 showed that these data were distributed normally (Appendix VII). A difference score was also created to control for an individual’s level of saturated fat consumption at T1. This variable was calculated by the subtraction of score for saturated fat consumption at T1 from the individual’s score at T2. This distribution was also normally distributed (Appendix VII). The difference scores (T2-T1) for both walking and saturated fat consumption were utilised as key outcome measures due to their normal distribution and the ability to control for T1 scores.

5.3 Scale properties and sample means at Time 1

The sample means, standard deviations and observed range for each scale at T1 (shortly after hospital discharge following the PCI) are presented in Table 5.1. T1 scores for the
PMTplus scales (PMT threat appraisal, PMT coping appraisal and emotional appraisal) along with health behaviour measures are reported in this section along with Cronbach’s alpha for internal consistency of scales.

5.3.1 PMTplus Variables at Time 1

For all scales, higher scores indicated higher levels of the construct being measured. Cronbach’s alpha was acceptable for each PMTplus measure (around 0.7 or greater), with very high internal consistency evident for exercise self efficacy. As shown in Table 5.1, patient scores for most PMTplus scales covered the full scale range at T1. One exception was perceived severity where the distribution of scores clustered at the higher end of the scale. Means were in the upper end of the scale range for perceived severity as well as both exercise and dietary self efficacy. This represented high levels of perceived severity and high levels of self efficacy amongst respondents at T1. Mean scores were relatively low for the T1 scale measuring future distress regarding a future MI, suggesting that participants’ distress regarding a future MI was relatively low.

The distress regarding a future event scale, a measure of emotional appraisal, had a large number of missing cases, with data available for only 151 of the 216 cases. None of the sociodemographic and medical variables of age group, gender, marital status, occupational group, school leaving age, CR attendance and diagnostic group were significantly associated with a case having missing data for this scale, leading to the assumption that data were missing randomly. However, the probability of a case having missing items on this scale was systematically linked to the interviewer who administered the schedule. One interviewer (RH) had missing data on this item in only 13% of cases while a second interviewer trained by RH had missing data for this item on 41% of cases. The high level of missing data were largely due to reluctance to respond to the question, probably due to the confronting nature of the items in this scale (which asked patients to consider the possibility of a future MI) interacting with a reluctance to probe on the behalf of the less experienced interviewer.
Table 5.1  Sample means, standard deviations, minimum and maximum observed values and Cronbach’s alpha for PMTplus scales and health behaviours at Time 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Possible range</th>
<th>Actual range</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha</th>
<th>No. of items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PMT threat appraisal T1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severity</td>
<td>204</td>
<td>1-6</td>
<td>2-6</td>
<td>4.66</td>
<td>.90</td>
<td>NA</td>
<td>1</td>
</tr>
<tr>
<td>Vulnerability - diet</td>
<td>189</td>
<td>1-5</td>
<td>1-5</td>
<td>3.54</td>
<td>1.04</td>
<td>.75</td>
<td>3</td>
</tr>
<tr>
<td>Vulnerability - exercise</td>
<td>185</td>
<td>1-5</td>
<td>1-5</td>
<td>3.47</td>
<td>1.05</td>
<td>.81</td>
<td>3</td>
</tr>
<tr>
<td><strong>PMT coping appraisal T1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy - diet</td>
<td>211</td>
<td>1-5</td>
<td>1-5</td>
<td>3.37</td>
<td>1.02</td>
<td>NA</td>
<td>1</td>
</tr>
<tr>
<td>Response efficacy - exercise</td>
<td>202</td>
<td>1-5</td>
<td>1-5</td>
<td>3.40</td>
<td>.91</td>
<td>NA</td>
<td>1</td>
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<tr>
<td>Self efficacy - diet</td>
<td>214</td>
<td>1-5</td>
<td>1-5</td>
<td>4.33</td>
<td>.79</td>
<td>.84</td>
<td>4</td>
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<td>Self efficacy - exercise</td>
<td>213</td>
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<td>4.31</td>
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<td><strong>Future concerns T1</strong></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Distress regarding future MI</td>
<td>151</td>
<td>1-5</td>
<td>1-5</td>
<td>2.09</td>
<td>1.11</td>
<td>.92</td>
<td>4</td>
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<td><strong>Health behaviours T1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Walking episodes</td>
<td>216</td>
<td>NA</td>
<td>0-15</td>
<td>3.45</td>
<td>3.32</td>
<td>NA</td>
<td>1</td>
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<tr>
<td>Saturated fat intake</td>
<td>216</td>
<td>0-32</td>
<td>0-22</td>
<td>10.48</td>
<td>5.14</td>
<td>.73</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Alpha = Cronbach’s alpha; SD = standard deviation; NA = not applicable – Cronbach’s alpha not calculated as single item only; MI = myocardial infarction; T1 = Time 1 shortly after hospital discharge; Ns varied due to missing data.

5.3.2 Health behaviours at Time 1

The two behavioural outcomes at T1, measured shortly after hospital discharge, covered walking behaviour and saturated fat intake. Scores on the number of weekly walking episodes of greater than 20 minutes duration ranged from 0-15 as shown in Table 5.1.

Scores for T1 saturated fat intake in this sample ranged from 0 to 22 as shown in Table 5.1. The maximum score obtained in this sample was lower than the possible scale maximum of 32. Higher scores indicate a higher level of saturated fat in the diet. Cronbach’s alpha for this eight item scale was good at .73.
5.4 Scale properties and sample means at Time 2

All scales administered at T1 were re-administered six months later at T2. The sample means, standard deviations, observed range and Cronbach’s alphas for the PMTplus measures at T2 (six months follow-up) are presented in Table 5.2. T2 scores for health behaviours are also presented in Table 5.2 and are described in this section.

5.4.1 PMTplus variables at Time 2

Cronbach’s alpha was acceptable for each PMTplus scales at T2 (above 0.7), with very high internal consistency evident for exercise self efficacy along with a very high level of internal consistency for the future distress scale. These findings indicate a high level of internal reliability in all scales at T2.

The observed range of patients’ scores on PMTplus measures at T2 did not cover the full scale range. The only exception to this was the exercise self efficacy scale, as shown in Table 5.2. The distribution of scores on the PMTplus scales with reduced ranges clustered at the top end of the available range with the exception of exercise response efficacy and distress regarding a future event. Interestingly, the exercise response efficacy scale was restricted in both directions, with scores clustered in the centre of the possible range on this scale. Means on all the PMTplus threat scales were relatively high at T2. High scores on the severity and vulnerability scales indicated that most patients viewed their cardiac event as severe and believed that further heart problems would be likely if no action were taken to reduce risk. Means on the T2 PMTplus coping appraisal scales of response efficacy and self efficacy, for both low fat diet and exercise behaviour, were also high. These high scores represented high levels of belief in the efficacy of diet and exercise to avert risk and a high level of self efficacy in the undertaking of such risk behaviour. As seen in Table 5.2, patients’ scores on the PMTplus measure of distress regarding a future cardiac event did not cover the full scale range, with scores clustering at the lower end of the scale range. Mean scores were also relatively low for this scale indicating a fairly low level of emotional distress concerning the prospect of a future MI. Unfortunately, problems with the low completion of the future distress scale items that were observed at T1 were also evident at T2.
Table 5.2  Sample means, standard deviations, minimum and maximum observed values and Cronbach’s alpha of PMTplus scales and health behaviours at Time 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Possible range</th>
<th>Actual range</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha</th>
<th>No. of items</th>
</tr>
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<tbody>
<tr>
<td><strong>PMT threat appraisal T2</strong></td>
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<td>Future distress</td>
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<td>.92</td>
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<td>3.05</td>
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<td>0-20</td>
<td>10.00</td>
<td>3.33</td>
<td>.51</td>
<td>8</td>
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</tbody>
</table>

Note: Alpha = Cronbach’s alpha; SD = standard deviation; NA=not applicable – Cronbach’s alpha not calculated as single item only; T2 = Time 2 six months post-hospital discharge; Ns varied due to missing data.

5.4.2  Health behaviours at Time 2 follow-up

The two behavioural outcomes covered walking behaviour and saturated fat intake. Scores on the number of weekly walking episodes of greater than 20 minutes duration at T2 ranged from 0-14, as shown in Table 5.2. The mean score for this item was relatively low, on average patients undertook just over four walking episodes per week. However a relatively high standard deviation on this measure indicated a wide variety of walking habits among these patients.

Scores for saturated fat intake at T2 in this sample ranged from 0 to 20 as shown in Table 5.2. Higher scores indicate a higher level of saturated fat in the diet. The maximum score
obtained in this sample was lower than the possible scale maximum of 32 indicating relatively low levels of saturated fat intake in the patient group.

5.5 Change in health behaviours and PMTplus measures

Mixed model ANOVA with repeated measures were used to test for effects of the independent variables of CR attendance, diagnostic group and time on the PMTplus dependent variables of severity, dietary vulnerability, exercise vulnerability, dietary self efficacy, exercise self efficacy, dietary response efficacy, exercise response efficacy and distress regarding a future MI as well as on the two health behaviour measures of saturated fat intake and walking episodes. In the mixed model repeated measures ANOVAs, the within-subject factor was time for each of the PMTplus and health behaviour variables. The two between-subject factors were the independent variables of participation in CR (attenders / non-attenders) and diagnostic group (STEMI or Non-STEMI vs. SA). Separate 2x2x2 mixed model ANOVAs were performed for each of the dependent variables. This series of analyses addresses the first aim of this thesis.

Results of the 2x2x2 ANOVAs for each of the PMTplus variables are presented in section 5.5.1. Means and standard deviations for the PMTplus variables for CR attenders and non-attenders and for each diagnostic group are shown in Table 5.3. The results of the 2x2x2 ANOVAs for each of the two health behaviour variables (saturated fat consumption and walking episodes) are presented in section 5.5.2. Means and standard deviations for the health behaviour variables for CR attenders and non-attenders and for each diagnostic group are shown in Table 5.3. Full ANOVA summary tables for both PMTplus and health behaviour analyses are contained in Appendix VIII.

5.5.1 Change in PMTplus measures

For the variable of severity, the three-way ANOVA showed a highly significant main effect for time \([F(1,175) = 23.37; p < .001]\). Perceptions of severity increased between T1 and T2 over the six months of the study (see Table 5.3). There were no significant interaction effects between time and diagnostic group \([F(1,175) = .24; p = .62]\), time and CR attendance \([F(1,175) = 1.12; p = .29]\), or between time, diagnostic group and CR attendance \([F(1,175) = .79; p = .37]\). Perception of severity increased significantly over time regardless of CR attendance status or diagnostic group membership.
When dietary vulnerability was examined using a three-way ANOVA, a highly significant main effect for time was also evident \[ F(1,156) = 58.53; p < .001 \]. Perception of dietary vulnerability increased between T1 and T2 (see Table 5.3). There were no significant interaction effects between time and diagnostic group \[ F(1,156) = .81; p = .37 \], time and CR \[ F(1,156) = .33; p = .57 \], or between time, diagnostic group and CR attendance \[ F(1,156) = .11; p = .74 \]. Perception of dietary vulnerability increased significantly over time regardless of CR attendance status or diagnostic group.

Exercise vulnerability behaved in a similar manner to dietary vulnerability. Once again there was a highly significant main effect for time \[ F(1,151) = 36.17; p < .001 \]. Perceptions of exercise vulnerability increased between T1 and T2 (see Table 5.3 for means and standard deviations). There were no significant interaction effects between time and diagnostic group \[ F(1,151) = .35; p = .56 \], time and CR attendance \[ F(1,151) = .04; p = .78 \], or between time, diagnostic group and CR attendance \[ F(1,151) = .01; p = .91 \]. The increase in exercise vulnerability occurred regardless of CR attendance status or diagnostic group.

A three-way ANOVA that examined change in perception of dietary response efficacy showed a highly significant main effect for time \[ F(1,179) = 27.08; p < .001 \]. Perceptions of dietary response efficacy increased between T1 and T2 (see Table 5.3). There were no significant interaction effects between time and diagnostic group \[ F(1,179) = .01; p = .99 \], or time and CR attendance \[ F(1,179) = .25; p = .62 \]. There was also no significant three-way interaction effect between time, diagnostic group and CR attendance \[ F(1,179) = 3.49; p = .06 \]. The increase in dietary response efficacy occurred regardless of diagnostic group or CR attendance status.

There was also a significant main effect for time when change in perception of exercise response efficacy was examined using a three-way ANOVA \[ F(1,169) = 5.53; p = .02 \]. Perceptions of exercise response efficacy increased between T1 and T2 (see Table 5.3). There were no significant interaction effects between time and diagnostic group \[ F(1,169) = .87; p = .35 \] or between time and CR attendance \[ F(1,169) = .09; p = .76 \]. There was also no significant three-way interaction effect between time, diagnostic group and CR attendance \[ F(1,169) = .24; p = .12 \]. The increase in exercise response efficacy over time occurred regardless of diagnostic group or CR attendance.
Table 5.3 Means and standard deviations of PMTplus measures for CR attenders and non-attenders in both diagnostic groups

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>ACS M (SD)</th>
<th>SA M (SD)</th>
<th>All M (SD)</th>
<th>ACS M (SD)</th>
<th>SA M (SD)</th>
<th>All M (SD)</th>
</tr>
</thead>
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<tr>
<td>CR attender</td>
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<td>4.77 (.88)</td>
<td>4.96 (.69)</td>
<td>5.16 (.58)</td>
<td>4.82 (.63)</td>
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</tr>
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<td>CR non-attender</td>
<td>4.44 (1.08)</td>
<td>4.41 (.82)</td>
<td>4.92 (.77)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>4.64 (.93)</td>
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<td>4.96 (.68)</td>
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<tr>
<td>Dietary vulnerability</td>
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<td></td>
</tr>
<tr>
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<td>4.21 (.73)</td>
<td>4.17 (.77)</td>
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<td>4.04 (.65)</td>
<td>4.21 (.74)</td>
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<td>3.53 (1.03)</td>
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<td>4.20 (.72)</td>
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<td>3.40 (1.01)</td>
<td>4.09 (.72)</td>
<td>4.03 (.75)</td>
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<tr>
<td>All</td>
<td>3.46 (1.02)</td>
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<td>3.71 (.52)</td>
<td>3.69 (.52)</td>
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<td>All</td>
<td>3.39 (.99)</td>
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<td>3.77 (.48)</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>CR attender</td>
<td>3.41 (.84)</td>
<td>3.45 (.91)</td>
<td>3.56 (.61)</td>
<td>3.69 (.47)</td>
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<td>3.52 (.57)</td>
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<tr>
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<td>3.56 (.56)</td>
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<td>4.81 (.38)</td>
<td>4.73 (.41)</td>
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<tr>
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<td>4.24 (.87)</td>
<td>4.71 (.55)</td>
<td>4.71 (.62)</td>
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</tr>
<tr>
<td>All</td>
<td>4.33 (.78)</td>
<td></td>
<td>4.76 (.47)</td>
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<tr>
<td>Exercise self efficacy</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>CR attender</td>
<td>4.30 (.82)</td>
<td>4.43 (.83)</td>
<td>4.52 (.94)</td>
<td>4.73 (.79)</td>
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<tr>
<td>CR non-attender</td>
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<td>4.31 (.93)</td>
<td>4.21 (1.09)</td>
<td>4.21 (1.18)</td>
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<tr>
<td>All</td>
<td>4.32 (.89)</td>
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<td>4.44 (1.01)</td>
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<tr>
<td>CR attender</td>
<td>2.28 (1.17)</td>
<td>2.40 (1.11)</td>
<td>1.74 (.84)</td>
<td>1.69 (.85)</td>
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<tr>
<td>CR non-attender</td>
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<td>1.56 (.88)</td>
<td>1.75 (.69)</td>
<td>1.25 (.27)</td>
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<tr>
<td>All</td>
<td>2.21 (1.12)</td>
<td></td>
<td>1.66 (.77)</td>
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Note: CR = cardiac rehabilitation, ACS = acute coronary syndrome, SA=stable angina
When dietary self efficacy was examined using a three-way ANOVA there was, once again, a highly significant main effect for time \([F(1,180) = 54.46; p < .001]\) with perceptions of dietary self efficacy increasing from T1 to T2 (see Table 5.3). There were no significant interaction effects between time and diagnostic group \([F(1,180) = .59; p = .45]\) or between time and CR attendance \([F(1,180) = .03; p = .86]\). There was also no significant three-way interaction effect between time, diagnostic group and CR attendance \([F(1,180) = .06; p = .81]\). Perceptions of dietary self efficacy increased over time regardless of diagnostic group or CR attendance status.

Perception of exercise self efficacy was also examined using a three-way ANOVA. Exercise self efficacy was the only PMTplus variable that did not show a significant main effect for time \([F(1,178) = 1.45; p = .23]\). While there were no significant interaction effects between time and diagnostic group \([F(1,178) = .01; p = .91]\), a significant interaction effect was evident between time and CR attendance \([F(1,178) = 5.43; p = .02]\). Patients who attended CR increased their exercise self efficacy over time, while non-attenders decreased their exercise self efficacy over time (see Figure 5.1). There was no significant three-way interaction effect between time, diagnostic group and CR attendance \([F(1,178) = .20; p=.65]\).

![Figure 5.1](image.png)

**Figure 5.1** Mean scores for exercise self efficacy at T1 and T2 for CR attenders and CR non-attenders showing interaction between CR attendance and exercise self efficacy

A three-way ANOVA was used to examine change over time in distress regarding a future MI. Results showed a highly significant main effect for time \([F(1,105) = 28.45; p < .001]\). Patients’ scores on this variable decreased between T1 and T2 (see Table 5.3). There were no significant interaction effects between time and diagnostic group \([F(1,105) = .05; p = .82]\) or between time and CR attendance \([F(1,105) = .84; p = .36]\). There was also no significant three-
way interaction effect between time, diagnostic group and CR attendance \[ F(1,105) = 1.11; p = .29 \]. The decrease in future distress scores over time occurred regardless of diagnostic group or CR attendance status.

### 5.5.2 Change in health behaviours

A three-way ANOVA was used to examine change in walking behaviour over time. Results of this analysis showed a significant main effect for time \[ F(1,182) = 5.19; p = .02 \], with the number of walking episodes increasing between T1 and T2 (refer to Table 5.4 for mean scores). There were no significant interaction effects evident between time and diagnostic group \[ F(1,182) = 1.51; p = .22 \] or between time and CR attendance \[ F(1,182) = 2.09; p = .15 \]. In addition there were no significant three-way interaction effects between time, diagnostic group and CR attendance \[ F(1,182) = .09; p = .76 \].

A three-way ANOVA was also used to determine whether there was a change in saturated fat intake over time. Results showed no significant main effect for time \[ F(1,181) = .56; p = .45 \] (refer to Table 5.4). In addition, there were no significant interaction effects between time and diagnostic group \[ F(1,181) = .09; p = .75 \]. Conversely, a significant interaction effect was evident between change in saturated fat intake over time and CR attendance \[ F(1,182) = 4.16; p = .04 \]. CR attenders decreased their saturated fat intake over time while non-attenders increased their saturated fat intake over time, as shown in Figure 5.2. There was no significant three-way interaction effect between time, diagnostic group and CR attendance \[ F(1,181) = .02; p = .88 \].

![Figure 5.2](image_url)  
**Figure 5.2** Mean scores for saturated fat intake at T1 and T2 for CR attenders and non-attenders
Table 5.4 Means and standard deviations for saturated fat intake and walking episodes for CR attenders and non-attenders in both diagnostic groups

<table>
<thead>
<tr>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACS</td>
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<td></td>
<td>$M$</td>
</tr>
<tr>
<td>Saturated fat intake</td>
<td></td>
</tr>
<tr>
<td>CR attender</td>
<td>10.0</td>
</tr>
<tr>
<td>CR non-attender</td>
<td>10.7</td>
</tr>
<tr>
<td>All</td>
<td></td>
</tr>
<tr>
<td>Walking episodes</td>
<td></td>
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<tr>
<td>CR attender</td>
<td>2.8</td>
</tr>
<tr>
<td>CR non-attender</td>
<td>3.8</td>
</tr>
<tr>
<td>All</td>
<td></td>
</tr>
</tbody>
</table>

Note: ACS = acute coronary syndrome; SA = stable angina; CR = cardiac rehabilitation; $n = 186$ for saturated fat intake; $n = 185$ for walking episodes

5.5.2 Summary of results of three-way ANOVAs

In summary, the PMTplus and health behaviour variables that showed a significant main effect for time were the variables of severity, dietary vulnerability, exercise vulnerability, dietary response efficacy, exercise response efficacy, dietary self efficacy, distress regarding a future MI and walking. All, except distress regarding a future MI, significantly increased over time. Distress regarding a future MI, significantly decreased over time. No significant interaction effects were evident between time, diagnostic group or CR attendance for any of these PMTplus and health behaviour variables (severity, dietary vulnerability, exercise vulnerability, dietary response efficacy, exercise response efficacy, dietary self efficacy, distress regarding a future MI and walking). The only PMTplus and health behaviour variables that did not show a significant main effect for time were exercise self efficacy and saturated fat intake. Interestingly, CR was clearly beneficial for this patient group. There was a significant
interaction effect between exercise self efficacy and CR attendance (as shown in Figure 5.1) as well as between saturated fat intake and CR attendance (as shown in Figure 5.2). Exercise self efficacy scores increased over time in CR for attenders and decreased over time in CR non-attenders. Conversely saturated fat intake decreased over time in CR attenders and increased over time in CR non-attenders.

5.6 Relationships between the variables

The matrix of correlations between all variables at T1 was examined; details of significant correlations are shown in Table 5.5. There was a significant positive correlation between perception of severity and distress regarding a future MI. As perception of severity increased, so did the level of distress regarding a future MI. Interestingly, at T1 the threat appraisal measure of severity was not significantly associated with either dietary or exercise vulnerability. Of further interest is the finding of a significant association at T1 between the two exercise coping appraisal measures, namely, exercise response efficacy and exercise self efficacy, while no significant association was evident between the two dietary coping appraisal measures at T1.

There were some interesting associations between the dietary measures. At T1, increased dietary vulnerability was associated with higher dietary response efficacy and also with higher saturated fat intake, as shown in Table 5.5. In addition, at T1 dietary self efficacy was negatively correlated with distress regarding a future MI and also with saturated fat intake. As dietary self efficacy increased, saturated fat intake decreased, as did level of distress regarding a future MI. In addition, there was a significant positive correlation between severity and saturated fat intake at T1 and between vulnerability and saturated fat intake at T1. At T1 increased severity and increased vulnerability were associated with increased saturated fat intake (see Table 5.5 for more details).

Some overlap was evident at T1 between the PMTplus dietary variables and the PMTplus exercise variables. In particular, exercise vulnerability and dietary vulnerability were highly correlated at T1. Diet response efficacy and exercise response efficacy were also significantly correlated at T1, as were dietary self efficacy and exercise self efficacy (refer to Table 5.5 for fuller details).
In terms of the exercise variables, at T1 there was a significant positive correlation between exercise vulnerability and exercise response efficacy. Interestingly, walking episodes was positively correlated with exercise self efficacy and negatively correlated with distress regarding a future MI. This indicated that as walking increased exercise self efficacy also increased, but as distress increased exercise self efficacy decreased (see Table 5.5).

The relationship between the variables at T2 was also investigated using Pearson product moment correlation coefficient; details of significant correlations are shown in Table 5.6. The positive correlation between perception of severity and distress regarding a future event, observed at T1, remained significant at T2. As perception of severity increased, so did level of distress regarding a future MI.

Interestingly, while at T1 the threat appraisal measure of severity was not significantly associated with any other threat appraisal measure, by T2 severity was significantly associated with both the threat appraisal measure of dietary vulnerability and the threat appraisal measure of exercise vulnerability, as shown in Table 5.6. In addition, at T2 both the exercise coping appraisal measures, namely, exercise response efficacy and exercise self efficacy were significantly associated, as were both of the dietary coping appraisal measures, namely, dietary response efficacy and dietary self efficacy.

In terms of the T2 dietary measures, a significant negative correlation was evident between dietary self efficacy and saturated fat intake, with increased dietary self efficacy associated with reduced saturated fat intake. In addition, there was also a significant positive correlation between dietary vulnerability and dietary self efficacy as well as between dietary self efficacy and severity.

Overlap between the PMTplus dietary variables and the PMTplus exercise variables which were evident at T1, remained evident at T2. In particular, exercise vulnerability and dietary vulnerability remained highly correlated. Diet response efficacy and exercise response efficacy were also significantly correlated at T2, as were dietary self efficacy and exercise self efficacy (refer to Table 5.6 for fuller details).
<table>
<thead>
<tr>
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<th>Vulnerability exercise</th>
<th>Vulnerability diet</th>
<th>Response efficacy - exercise</th>
<th>Response efficacy - diet</th>
<th>Self efficacy - exercise</th>
<th>Self efficacy - diet</th>
<th>Future distress</th>
<th>Walking episodes</th>
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<tr>
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<td>-.14*</td>
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Note: ** p<.01; * p<.05; ns = non significant
Table 5.6  Matrix of correlation coefficients for PMT\textit{plus} variables and health behaviour variables at \textit{Time two} showing significant Pearson product moment correlations

<table>
<thead>
<tr>
<th></th>
<th>Severity</th>
<th>Vulnerability exercise</th>
<th>Vulnerability diet</th>
<th>Response efficacy - exercise</th>
<th>Response efficacy - diet</th>
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<th>Future distress</th>
<th>Walking episodes</th>
<th>Saturated fat intake</th>
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<td>.40**</td>
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<tr>
<td>Walking episodes</td>
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<td></td>
<td></td>
<td></td>
<td>-.16*</td>
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</tbody>
</table>

Note: ** p<.01; * p<.05; ns = non significant
In terms of specific physical activity variables measured at T2, there was a positive correlation between severity and exercise vulnerability and also between exercise response efficacy and both exercise self efficacy and walking. As can be seen from Table 5.6, significant positive associations were also evident between exercise vulnerability and exercise self efficacy and between exercise vulnerability and exercise response efficacy. At T2 as exercise vulnerability increased, both exercise response efficacy and exercise self efficacy also increased.

5.7 Difference scores

Change over time in this group of PCI patients was investigated through calculation of difference scores which are also known as ‘change scores’ (Liang & Zeger, 2000). These change scores were calculated by subtracting each patients’ score at T1 from patients’ scores at T2 (T2-T1). Change over time has previously been used as an outcome measure in a study which utilised PMT constructs to predict movement through stages of change (Reid, et al., 2007). Change scores have been used in studies of patients with CHD where a longitudinal approach to data collection has been adopted (Barry, Kasl, Lichtman, Vaccarino, & Krumholz, 2006; Conaway, et al., 2003; Elizur & Hirsh, 1999; Lau-Walker, 2006; Mitchell, et al., 2005).

5.7.1 Relationships between difference (T2-T1) scores

The relationships between the difference (T2-T1) scores were investigated using Pearson product moment correlation coefficient (see Table 5.7). Looking first at the exercise measures, change in exercise vulnerability was positively associated with both change in exercise response efficacy and with change in exercise self efficacy. Change in exercise response efficacy was also positively correlated with change in exercise self efficacy. In addition, change in exercise self efficacy was positively correlated with change in walking episodes. Interestingly, change in future distress was negatively correlated with change in walking; as distress regarding a future MI increased over time, walking decreased.

In terms of specific dietary variables, change in dietary vulnerability was positively correlated with change in dietary response efficacy. As vulnerability increased, so did perception of response efficacy. In addition, change in dietary self efficacy was positively associated with change in dietary response efficacy. As dietary self efficacy increased, so did dietary response efficacy. Change in dietary self efficacy was negatively associated with change in distress regarding a future MI; as distress increased, dietary self efficacy decreased.
Table 5.7  Matrix of correlation coefficients for difference scores in PMTplus measures and health behaviours showing significant Pearson product moment correlations

<table>
<thead>
<tr>
<th></th>
<th>T2-T1 Severity</th>
<th>T2-T1 Vulnerability-exercise</th>
<th>T2-T1 Vulnerability-diet</th>
<th>T2-T1 Response efficacy-exercise</th>
<th>T2-T1 Response efficacy-diet</th>
<th>T2-T1 Self efficacy-exercise</th>
<th>T2-T1 Self efficacy-diet</th>
<th>T2-T1 Future distress</th>
<th>T2-T1 Walking episodes</th>
<th>T2-T1 Saturated fat intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2-T1 Severity</td>
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<td>.16*</td>
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</tr>
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<td>.45**</td>
<td>.35**</td>
<td>.19*</td>
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<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>.20*</td>
</tr>
<tr>
<td>T2-T1 Vulnerability-diet</td>
<td>.31**</td>
<td>.46**</td>
<td>ns</td>
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<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>.23**</td>
</tr>
<tr>
<td>T2-T1 Response efficacy-exercise</td>
<td>.40**</td>
<td>.32**</td>
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<td>ns</td>
<td>ns</td>
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<td>ns</td>
<td>-.26*</td>
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<tr>
<td>T2-T1 Self efficacy-diet</td>
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<td>ns</td>
<td>ns</td>
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</tr>
<tr>
<td>T2-T1 Future distress</td>
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</tr>
</tbody>
</table>

Note: ** *p<.01; * p<.05; ns = non significant
Interestingly change in dietary vulnerability was also associated with change in saturated fat intake. As vulnerability increased over time so did intake of saturated fat.

Once again, some cross-over was evident between the dietary and the physical activity measures. Change in dietary vulnerability was strongly associated with change in exercise vulnerability. Change in exercise and dietary response efficacy was correlated as was change in exercise and dietary self efficacy.

5.8 PMTplus physical activity model testing

Hierarchical regression analysis was utilised to test the PMTplus physical activity model. Firstly univariate analysis was conducted to check whether sociodemographic, medical and impact of event variables influence change in walking behaviour (T2-T1 walking). Results from these analyses are reported in section 5.8.1. The order of entry of variables into the PMTplus physical activity model is reported in section 5.8.2. Results of the model testing of the PMTplus physical activity model using a hierarchical regression analysis is reported in section 5.8.3.

5.8.1 Univariate analyses of effects of potential confounders on T2-T1 walking

Univariate analyses were conducted to determine whether sociodemographic, medical factors and impact of event variables significantly contributed to change in walking over time (T2-T1 walking). Variables which contributed to change in walking over time were added to the regression analysis at step one in order to control for their influence on the outcome variable. This technique of using univariate analyses to identify variables to be included in multiple regression analysis has been commonly used in research into patients’ behavioural choices (Murphy, Elliott, Worcester, Higgins, Le Grande, Roberts, & Goble, 2008; Murphy, Worcester, Elliott, Le Grande, Higgins, & Goble, 2006).

Independent sample t-tests and one-way ANOVA were conducted to determine whether sociodemographic, medical factors or impact of event factors were significant predictors of the change in walking over time (T2-T1 walking). The sociodemographic factors that were examined were age group, gender, marital status, school leaving age and occupational status. The medical variable examined was number of vessels treated. Impact of event variables examined were painfullness of event and emotional reaction to the event. Separate independent sample t-tests were conducted to examine the influence of gender (male/female), age group ( < 60 years / ≥ 60 years), marital status (married/unmarried), school leaving age (left school < 15
years / ≥ 15 years), occupational status (blue collar/ white collar), painfullness of event (low/high), and number of vessels treated (single/multiple) on change in walking over time (T2-T1 walking). One-way ANOVA was conducted to examine the influence of emotional impact of event (low/medium /high) on change in walking over time (T2-T1 walking).

For the sociodemographic factors, results from T-tests showed a significant difference in change in walking over time (T2-T1 walking) for age group. Younger patients had a higher score on T2-T1 walking ($M = 1.79$, $SD = 3.69$) compared to older patients ($M = 0.05$, $SD = 3.66$; $t (194) = 3.32$, $p = .001$). The magnitude of the difference in the means was moderate ($\eta^2 = .054$). Given that younger patients were walking at a significantly lower level than older patients at T1 but not at T2, this result represents the younger patients catching up to the walking level of the older patients. There were no significant differences at the .05 level in T2-T1 walking based on gender, marital status, school leaving age, occupational status, painfulness of event, or number of vessels treated. Results from one-way ANOVA conducted to examine the contribution of the impact of event variable to change over time in walking (T2-T1 walking) showed no significant differences at a $p$ of less than .05 level based on level of impact of event. In addition, results from previous three way ANOVAs, reported in section 5.5.2, showed no significant impact of CR attendance or diagnostic group on change in walking episodes over time. Overall, age group was the only sociodemographic, medical or impact of event variable that was found to contribute to change in walking episodes over time.

5.8.2 Order of entry of variables into the PMTplus physical activity model

A four step, hierarchical regression analysis was performed to test the ability of the PMTplus physical activity model to predict change in walking over time (T2-T1 walking). The demographic variable of age group, identified in the preceding analyses, was entered into the PMTplus physical activity model at step one, to control for the influence of this variable on the outcome variable of T2-T1 walking. Following this, the PMTplus predictor variables were entered in order of theoretical priority. The threat appraisal measures of change in severity (T2-T1 severity) and change in exercise vulnerability (T2-T1 exercise vulnerability) were entered at step two of the model. The coping appraisal measures of change in exercise response efficacy (T2-T1 exercise response efficacy) and change in exercise self efficacy (T2-T1 exercise self efficacy) were entered at step three of the model. Finally, the emotional appraisal measure of change in future distress (T2-T1 future distress) was entered at step four of the model testing.
5.8.3 PMTplus physical activity model testing

The results of the regression analyses, predicting change in walking over six months, together with the standardised regression coefficients of the predictor variables, $R$, $R^2$ and adjusted $R^2$ at each step of equation building, are shown in Table 5.8.

At step one of the equation, with only age entered in the equation, the model was significant ($F_{1, 94} = 5.33, p = .02$). At this stage, age was a significant unique predictor of change in walking episodes (T2-T1 walking), accounting for 5.4% of the explained variance in PCI patients who had undergone a first revascularisation procedure.

At step two, the two PMTplus threat appraisal measures of change in severity (T2-T1 severity) and change in exercise vulnerability (T2-T1 exercise vulnerability) were entered into the equation. The entry of the PMTplus threat appraisal variables of severity and exercise vulnerability did not significantly improve the predictive ability of the model ($F_{\text{change} 2, 92} = .27, p = .76$). Overall, at this stage, the model was no longer significant ($F_{3, 92} = 1.93, p = .13$). The addition of the threat appraisal variables to the model added very minimally to the percentage of variance explained in T2-T1 walking. At this stage, the overall model explained 5.9% of the variance in T2-T1 walking, mostly due to the significant unique contribution of age group which explained 4.9% of the unique variance in change in walking (see Table 5.8).

At step three, the two PMTplus coping appraisal measures of change in exercise response efficacy (T2-T1 exercise response efficacy) and change in exercise self efficacy (T2-T1 exercise self efficacy) were entered into the physical activity model. The addition of these two variables significantly improved the predictive power of the equation ($F_{\text{change} 2, 90} = 5.41, p = .006$), with the overall model at step three accounting for 16% of the variance in change in walking over time (T2-T1 walking) in PCI patients. At step three, the physical activity model was significant ($F_{5, 90} = 3.43, p = .007$) after the traditional threat appraisal and coping appraisal components of the PMT model had been entered into the model. At step three, there were two significant unique predictors of change in walking (T2-T1 walking); age explained 5.9% of significant unique variance, while change in exercise self efficacy explained 8% of significant unique variance (see Table 5.8) in change in walking over time (T2-T1 walking).

At step four, the PMTplus emotional appraisal measure of change in distress regarding a future MI (T2-T1 distress) was entered into the equation. At this stage, there was a significant
improvement in the model ($F_{\text{change} \, 2, \, 87} = 5.72$, $p = .02$). In total, the PMTplus exercise model explained 21.1% of the variance in change in walking (T2-T1 walking). The final PMTplus exercise model was significant ($F_{6, \, 89} = 3.96$, $p = .001$). When all variables had been entered into the model, there were three variables that made significant unique contributions to change in walking over time (see Table 5.8), namely age group, change in exercise self efficacy (T2-T1 exercise self efficacy) and change in distress regarding a future MI (T2-T1 distress). These three variables respectively explained 5.8%, 8.5% and 6.1% of the unique variance in change in walking over time (T2-T1 walking). Age group was negatively associated with change in number of walking episodes, indicating that younger patients were more likely than older patients to increase their walking over time. Not surprisingly, change in exercise self efficacy was positively associated with change in walking episodes over time, indicating that as self efficacy increased, the number of walking episodes correspondingly increased. Change in distress regarding a future MI was negatively associated with change in walking episodes over time, indicating that as distress increased over time, walking decreased.
Table 5.8  Standardised regression coefficients for predictors T2-T1 walking episodes using change in PMTplus variables at each step of a four-step hierarchical multiple regression analysis.

<table>
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<th>Variable</th>
<th>Step 1</th>
<th></th>
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<th>Step 4</th>
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<td>Beta</td>
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</table>

Fchange = .027, p = .76  
Fchange = .541, p = .006  
Fchange = .572, p = .02

R = .23  
R = .24  
R = .40  
R = .46

R² = .054  
R² = .059  
R² = .16  
R² = .21

Adjusted R² = .044  
Adjusted R² = .029  
Adjusted R² = .113  
Adjusted R² = .158

F = 5.33, p = .02  
F = 1.93, p = .13  
F = 3.43, p = .007  
F = 3.96, p = .001

Note: *p ≤ .05  **p ≤ .01; N = 114, due to missing data, Ns may vary for some comparisons; T1=time 1; T2=time 2;
5.9  **PMTplus dietary model testing**

Hierarchical regression analysis was also utilised to test the PMTplus dietary model. Firstly, univariate analyses were conducted to check whether sociodemographic, medical and impact of event variables influenced change in saturated fat intake (T2-T1 diet). Results from these analyses are reported in section 5.9.1. The order of entry of variables into the PMTplus dietary model is reported in section 5.9.2. Results of the model testing of the PMTplus dietary model using a hierarchical regression analysis is reported in section 5.9.3.

5.9.1  **Univariate analyses of effects of potential confounders on T2-T1 diet**

Univariate analyses, consisting of independent sample t-tests and one-way ANOVA were conducted to determine whether sociodemographic, medical factors or impact of event factors were significant predictors of the change in saturated fat intake over time (T2-T1 diet). The sociodemographic factors that were examined were age group, gender, marital status, school leaving age and occupational status. The medical variable examined was number of vessels treated. Impact of event variables examined were painfulness of event and emotional reaction to the event. Separate independent sample t-tests were conducted to examine the influence of gender (male/female), age group (< 60 years / ≥ 60 years), marital status (married/unmarried), age left school (left school < 15 years / ≥ 15 years), occupational status (blue collar/ white collar), painfulness of event (low/high), and number of vessels treated (single/multiple) on change in saturated fat intake over time (T2-T1 diet). One-way ANOVA was conducted to examine the influence of emotional impact of event (low/medium /high) on change in saturated fat intake over time (T2-T1 diet).

There were no significant differences at the .05 level in change in saturated fat intake (T2-T1 diet) based on age, gender, marital status, school leaving age, occupational status, painfulness of event, or number of vessels treated. Results from one-way ANOVA conducted to examine the contribution of the impact of event variable to change in saturated fat intake over time (T2-T1 diet) showed no significant differences at the $p<.05$ level based on level of impact of event. Results from previous, three-way ANOVAs, reported in section 5.5.2, showed CR was significantly associated with change in saturated fat intake over time, while diagnostic group was not significantly associated with change in saturated fat intake over time. Overall, the only
factor identified in preceding analyses as contributing to change in walking episodes over time was CR attendance.

5.9.2 Order of entry of variables into the PMTplus dietary model

A four-step hierarchical regression analysis was performed to test the ability of the PMTplus dietary model to predict change in saturated fat intake over time (T2-T1 diet). CR attendance, which was identified as having an impact on change in walking over time, was entered into the PMTplus dietary model at step one to control for the influence of this variable on the outcome variable of change in saturated fat intake over time (T2-T1 diet). Following this, the PMTplus predictor variables were entered in order of theoretical priority. The threat appraisal measures of T2-T1 severity and T2-T1 dietary vulnerability were entered at step two. The coping appraisal measures of T2-T1 dietary response efficacy and T2-T1 dietary self efficacy were entered at step three. Finally, the emotional appraisal measure of T2-T1 future distress was entered at step four of the model testing.

5.9.3 PMTplus dietary model testing

The results of the regression analyses predicting change in saturated fat intake over six months in PCI patients, together with the standardised and regression coefficients of the predictor variables ($\beta$), the semipartial correlations ($sr^2$), $R$, $R^2$ and adjusted $R^2$ at each step of equation building are shown in Table 5.9.

At step one, after CR attendance was entered into the PMTplus dietary model, the overall model was not significant ($F_{1, 99}$ = 2.23, $p = .14$), with CR explaining only 2.2% of the variance in T2-T1 saturated fat intake, (see Table 5.9).

At step two, the two PMTplus threat appraisal measures of change in severity (T2-T1 severity) and change in dietary vulnerability (T2-T1 dietary vulnerability) were entered into the equation. While the entry of the PMTplus threat appraisal variables of severity and dietary vulnerability at step two, did not significantly improve the predictive ability of the model ($F_{change2,97}$ = .29, $p = .66$), the overall model was significant ($F_{3,97}$ = 2.74, $p = .048$) explaining 8% of the variance in change in saturated fat intake (T2-T1 diet). This was largely due to the influence of the variable change in dietary vulnerability, which, at step two was a unique predictor of change in saturated fat intake (T2-T1 diet) explaining 5.3% of unique variance (see Table 5.9).
At step three, the two PMT plus coping appraisal measures of change in dietary response efficacy (T2-T1 dietary response efficacy) and change in dietary self efficacy (T2-T1 dietary self efficacy) were entered into the dietary model. After entry of the PMT coping appraisal measures of dietary response efficacy and dietary self efficacy at step three, there was no significant improvement in the regression equation \(F_{\text{change}2,95}=2.35, p =.10\). However, the overall model remained significant \(F_{5, 95}= 2.62, p =.03\). Again, this was largely due to the influence of the variable change in dietary vulnerability, which was at this stage, the only significant unique predictor of change in saturated fat intake, explaining 7.6% of unique variance (see Table 5.9). At step three, both the threat appraisal and the coping appraisal components of the PMT model had been entered into the dietary model. Overall, the PMT components of the PMT plus model explained 12% of the variance in change in saturated fat intake (see Table 5.9).

At step four, the final step of the model building, the emotional appraisal measure of change in distress regarding a future MI (T2-T1 distress) was entered into the dietary model to create the full PMT plus model, prompting a significant improvement in the model \(F_{\text{change}1, 94} =4.88, p =.03\). The final PMT plus dietary model was significant \(F_{6, 94}= 3.09, p =.008\). In total, the PMT plus dietary model explained 16.5% of the variance in change in saturated fat intake (T2-T1 diet). When all variables had been entered into the model, change in dietary vulnerability (T2-T1 dietary vulnerability) and change in distress regarding a future MI (T2-T1 distress) made significant unique contributions to the model, respectively explaining 8.9% and 4.9% of unique variance in the prediction of change in saturated fat intake (T2-T1 diet) after PCI (see Table 5.9). Interestingly, change in dietary vulnerability was positively associated with change in saturated fat intake over time (T2-T1 diet) indicating that as dietary vulnerability increased over time, the amount of saturated fat in the diet also increased. Conversely, change in distress regarding a future MI was negatively associated with change in saturated fat intake over time, indicating that as distress regarding a future MI increased over time, saturated fat intake correspondingly decreased.
Table 5.9  Standardised regression coefficients for predictors T2-T1 saturated fat intake using T2-T1 PMTplus variables at each step of a four-step hierarchical multiple regression analysis.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Step 1</th>
<th></th>
<th>Step 2</th>
<th></th>
<th>Step 3</th>
<th></th>
<th>Step 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>$sr^2$</td>
<td>Beta</td>
<td>$sr^2$</td>
<td>Beta</td>
<td>$sr^2$</td>
<td>Beta</td>
<td>$sr^2$</td>
</tr>
<tr>
<td>Non-PMTplus</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>CR attendance</td>
<td>.15</td>
<td>.023</td>
<td>.15</td>
<td>.023</td>
<td>.15</td>
<td>.023</td>
<td>.16</td>
<td>.028</td>
</tr>
<tr>
<td>PMTplus</td>
<td></td>
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<td>Threat</td>
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<td></td>
</tr>
<tr>
<td>Severity T2-T1</td>
<td>.05</td>
<td>.002</td>
<td>.09</td>
<td>.008</td>
<td>.11</td>
<td>.014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability diet T2-T1</td>
<td>.23*</td>
<td>.053</td>
<td>.30**</td>
<td>.076</td>
<td>.32**</td>
<td>.089</td>
<td></td>
<td></td>
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<tr>
<td>Coping</td>
<td></td>
<td></td>
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<tr>
<td>Response efficacy diet T2-T1</td>
<td>-.16</td>
<td>.021</td>
<td>-.15</td>
<td>.021</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self efficacy diet T2-T1</td>
<td>-.14</td>
<td>.019</td>
<td>-.19</td>
<td>.037</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Future concerns</td>
<td></td>
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<tr>
<td>Future distress T2-T1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.22*</td>
<td>.049</td>
<td></td>
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</tr>
</tbody>
</table>

F change\(=2.94, p=.06\) \quad F change\(=3.55, p=.10\) \quad F change\(=4.88, p=.03\)

\(R = .15\) \quad \(R = .28\) \quad \(R = .35\) \quad \(R = .41\)

\(R^2 = .022\) \quad \(R^2 = .078\) \quad \(R^2 = .121\) \quad \(R^2 = .165\)

Adjusted \(R^2 = .012\) \quad Adjusted \(R^2 = .050\) \quad Adjusted \(R^2 = .075\) \quad Adjusted \(R^2 = .112\)

\(F = 2.24, p = .14\) \quad \(F = 2.73, p < .05\) \quad \(F = 2.62, p = .03\) \quad \(F = 3.09, p = .008\)

Note: *\(p \leq .05\) **; \(p \leq .01\); \(N = 114\); due to missing data, Ns may vary for some comparisons; T1 = Time 1; T2 = Time 2;
Chapter 6 DISCUSSION

6.1 Outline of the chapter

The current results extend understanding of PCI patients’ behaviour, in that these findings delineate change over time in health behaviours, and change in cognitive appraisals and emotional appraisals in this patient group. In addition, the current results contribute to understanding of the factors that promote behaviour change in PCI patients. Importantly, the current results contribute a theoretical underpinning to the understanding of behaviour change in PCI patients, through the application of the PMTplus model.

Sections 6.2 and 6.3 discuss findings related to the first research aim of the thesis. Section 6.2 discusses the results regarding change over time in cognitive appraisals and also change over time in the emotional appraisal variable of distress regarding a future cardiac event. Change over time in health behaviours is discussed in section 6.3. Section 6.4 discusses the influence of CR, while section 6.5 looks at the influence of diagnostic group. Section 6.6 deals with associations between the variables. Section 6.7 discusses findings related to the second research aim of the thesis. In section 6.7 results from the testing of the PMTplus model are discussed. Section 6.8 examines the utility of the PMTplus model. Section 6.9 reviews the implication of these findings for the development of interventions targeting patients who have undergone a PCI. Section 6.10 discusses both the strengths and the limitations of the current study. In the final section, section 6.11, conclusions from the study and implications for future research are discussed.

6.2 Change over time in PMTplus measures

The first research aim of this thesis was to examine changes over six months in PMTplus measures and health behaviours in patients undergoing a first PCI. Given the limited longitudinal data available on this population, this study makes a contribution to the understanding of patients’ response to PCI. It is clear from the results that, after their cardiac event, PCI patients undergo considerable changes in their cognitive and emotional appraisals, as encapsulated by PMTplus measures. This section reviews findings of change over time in PCI patients’ threat, coping and emotional appraisals.
6.2.1 Change over time in threat appraisal

Threat appraisal included measures of patients’ perceptions of both the severity of their CHD and their perceptions of their own vulnerability to CHD in the future. In terms of threat appraisal, it appears that the PCI patients in the current study saw their disease as very serious, with mean scores at the high end of the severity rating scale. Unfortunately, the severity ratings of the PCI patients in the current study cannot be directly compared with the scores reported by others who have measured perceptions of severity in patients with CHD (Blanchard, et al., 2009; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, et al., 2009a). While a six-point Likert scale was used in the current study to measure perceptions of severity, a seven-point Likert scale was used by Tulloch and colleagues (2009), Reid and colleagues (2007) and also by Blanchard and colleagues (2009), whereas Plotnikoff and Higginbotham (1998) used a five-point scale to measure severity. Underestimation of disease severity has been noted in PCI patients (Astin & Jones, 2006). However, this does not appear to be the case with the PCI patients in the current study, with severity scores at the high end of the scale range at both baseline and six months. Conversely, the severity scores reported by Tulloch and colleagues (2009) were closer to the mid-point of their scale range, while those reported by Blanchard and colleagues (2009) were at the lower end of their scale range.

It appears that the PCI patients in the current study may have viewed their disease as more serious than the CHD patients in either of these studies (Blanchard, et al., 2009; Tulloch, et al., 2009a). This is particularly interesting, given that actual severity of CHD could have been higher in these samples (Blanchard, et al., 2009; Tulloch, et al., 2009a), which unlike the current study, did not exclude patients with a long history of CHD. Indeed, Tulloch and colleagues (2009) reported that around one quarter of the patients in their study had chronic heart failure, the end stage of CHD, yet this sample reported on average moderate severity ratings for their CHD.

There has been little comparative work to assess differences in perceptions of severity between PCI patients and other cardiac patients. However, previous studies of patients with CHD have reported little relationship between perception of disease severity and actual severity of MI (Petrie, Weinman, Sharpe, & Buckley, 1996). It may be that the apparent disparity in severity scores has less to do with disease severity and more to do with the characteristics of the sample. Disparities in education levels between patients in the current study and those recruited
by Blanchard, Reid and their respective colleagues (2009) might partially account for apparent disparities in severity scores. Patients in the current study had a fairly low level of education, around half had left school aged 15 or younger, having had nine or fewer years of education, while patients in the studies by Tulloch and colleagues (2009) and Blanchard and colleagues (2009) had a fairly high level of education, with an average of thirteen years or more of formal education. Others have found that educational level affects perception of symptom severity in patients with CHD (Jourdain, Funck, Bellorini, Tessier, Lejeune, Loiret, Thebault, Elhallak, Guillard, Abiaad, Genevieve, & Delattre, 2007). In the current sample, the low education levels of the PCI patients might partially account for their apparently higher perceptions of severity compared with other patients with CHD.

Interestingly, results of the current study showed that PCI patients’ perceptions of severity increased over time. This has not previously been demonstrated in PCI patients. Six months after their initial event, PCI patients in the current study, appraised their disease as more severe than they had initially assessed it to be, viewing the possible consequences of their CHD as more serious than they had initially seen them to be. The finding that severity increased over time in the PCI patients in the current study is somewhat surprising, given that other studies of patients with CHD have reported decreased severity over time (Blanchard, et al., 2009; Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Tulloch, et al., 2009a). This difference, in the pattern of severity over time, between the PCI patients in the current study and other heterogenous samples of patients with CHD (Blanchard, et al., 2009; Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Tulloch, et al., 2009a) may be due to the PCI patients in the current study being at an early stage of disease progression. The severity of their CHD may have become more apparent to the PCI patients in the current study over time, while for other patient groups recurrent hospitalisations may have reminded them of the severity of their CHD.

The dietary and exercise vulnerability scores at baseline and six months in the current study were above mid-point of the scale range for both time-points. Patients evidently experienced themselves as vulnerable to the threat of CHD. These results, for both severity and vulnerability, do not support the findings of previous qualitative studies which have reported that PCI patients generally have low levels of threat appraisal (Gaw, 1992; Hanson, 1988; Kimble, 1998). However the qualitative nature of these studies makes comparison across studies difficult as the nature of such studies may have led patients to discuss their perception of the
severity of their disease in greater detail than is common in quantitative studies such as the current one.

Unfortunately, the vulnerability ratings of the PCI patients in the current study cannot be directly compared with the scores reported by others who have measured perceptions of vulnerability in patients with CHD (Blanchard, et al., 2009; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, et al., 2009a). The current study used a conditional measure of vulnerability (Beck, 1984; Rogers, 1975; Sutton, 2004), which measured the probability of another cardiac event if specific mitigating behavioural changes were not undertaken, rather than the unconditional measure used in other studies of PMT in patients with CHD (Blanchard, et al., 2009; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, et al., 2009a). Given this difference in the variable measured, caution needs to be applied when comparing the behaviour of the vulnerability variable across these studies.

Results from the current study showed that the PCI patients’ perceptions of both exercise and dietary vulnerability increased over the six months of the study. The increase in vulnerability indicates that, over time, the PCI patients felt more vulnerable to future heart problems, if they did not undertake mitigating action to reduce such threats. Tulloch and colleagues (2009) similarly found that exercise vulnerability increased over six months. In contrast, Plotnikoff (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) found that both exercise and dietary vulnerability decreased over six months. Blanchard and colleagues also found a decrease in exercise vulnerability over time, although their study was conducted over a period of only three months, rather than the six month time period of the current study. It is evident that vulnerability is subject to change over time. While data for the Plotnikoff (1994) study was collected in the 1990s, data were collected more recently for both the current study and also the study conducted by Tulloch and colleagues (2009). The level of exposure to messages aimed at increasing patients’ awareness of vulnerability to CHD has increased over the last decades (Finnegan, Viswanath, & Hertog, 1999; Higgins, Naylor, Berry, O'Connor, & McLean, 2006; Kelly & Stanner, 2003; Schoberberger & Modes, 2005). This increased social marketing may have led to increased perceptions of vulnerability in more recent years.

The increase over time in PCI patients’ threat perceptions, both severity and vulnerability, may reflect an adaptation to the threat of CHD. The PCI patients in the current study were in the earliest stages of their disease trajectory. At the time of the initial interview,
many would have been just coming to terms with the diagnosis of CHD. Over the six months of the study, threat appraisal could have increased due to the integration of substantial new information and experiences. Higher perceptions of both severity and vulnerability, six months after the event, may reflect the process of coming to terms with the reality of their CHD.

It has previously been speculated that lower levels of behaviour change in PCI patients may be due to inappropriately low levels of threat perception (Kimble, 1998). Previous research has suggested that the minimally invasive nature of the PCI procedure leads patients to believe that CHD is easily treatable, with PCI seen as a curative procedure (Astin, et al., 2009; Gaw-Ens & Laing, 1994; Gentz, 2000; Shaw, Cohen, Fishman-Rosen, Murphy, Stertzzer, Clark, & Myler, 1986). However, while patients may hold such views, at least initially, it is apparent that threat perception evolves and changes over time. Threat perception appears to be a dynamic, rather than a static process in PCI patients. The use of a longitudinal design for this study has enabled additional insight into the dynamic nature of threat perception in PCI patients.

6.2.2 Change over time in coping appraisal

Coping appraisal was measured by patients’ perceptions of both the response efficacy of behaviour change, that is, perceptions of the effectiveness of change in diet and physical activity in reducing their CHD risk, and their own self efficacy or confidence in their ability to maintain behavioural changes.

The PCI patients in the current study had average response efficacy scores above the mid-point of the scale range for both diet and exercise response efficacy. Unfortunately, differences in Likert scale ranges again limit the direct comparison of response efficacy scores of the PCI patients in the current study with other studies which have measured response efficacy in patients with CHD. While a five-point Likert scale was used in the current study to measure perceptions of response efficacy, a seven-point Likert scale was used to measure response efficacy by both Tulloch and colleagues (2009) and Reid and colleagues (2007). Fortunately, both Blanchard and colleagues (2009), and Plotnikoff and Higginbotham (1998) used a five-point scale to measure response efficacy, enabling direct comparison of their response efficacy scores with those of the PCI patients in the current study. This comparison is hampered by the use of a single item to measure response efficacy in the current study, whereas Plotnikoff and Higginbotham (1998) used multiple items to measure response efficacy. However, Blanchard and colleagues (2009) similarly used a single item measure. It appears that
the PCI patients in the current study had lower levels of exercise response efficacy than those reported by either Blanchard and colleagues (2009) or Plotnikoff and Higginbotham (1998). In addition, PCI patients in the current study also had lower dietary response efficacy than that reported by Plotnikoff and Higginbotham (1998). These apparent lower levels of response efficacy may be due to the PCI patients in the current study being in the earliest stage of their disease trajectory. Since it is widely accepted that adults are more likely to attend to information which is relevant to them (Russell, 2006), it is reasonable to assume that patients at an early stage of disease progression may have had a lower cumulative level of awareness of health promotion messages about prevention of CHD compared with patients at a later stage of disease progression, for whom such information would have been personally relevant for a longer period of time.

In the current study, both diet and exercise response efficacy increased over the six months of the study. This shift indicates that, over time, the PCI patients in the current study were more likely to believe in the ability of both diet and exercise to reduce their personal risk of a further cardiac event. Interestingly, this finding is in direct contrast to the findings of Tulloch and colleagues (2009), who reported a reduction in exercise response efficacy over six months. However, given the very high baseline levels of response efficacy reported in that study, the reduction in response efficacy observed by Tulloch and colleagues (2009) may have represented response efficacy scores returning to a more realistic level by six months. Interestingly, response efficacy behaved differently again in a study by Blanchard and colleagues (2009) who reported that response efficacy remained stable over time. However, as the time period in that study was only three months, comparison with six month data has limited utility. Increased response efficacy over time, evident in the PCI patients in the current study, could evince a process of adjustment to living with CHD. Over time, as patients acknowledged the severity of their CHD and came to terms with their own vulnerability, the benefits of lifestyle change may have become more salient.

Results showed that the PCI patients in the current study had high levels of both exercise and dietary self efficacy at both time-points, with mean scores at the high end of the scale ranges. Unfortunately, differences in the type of self efficacy measured, limits comparison of the self efficacy scores of the PCI patients in the current study with other studies which have measured PMT constructs in patients with CHD.
In the current study, barrier self efficacy was measured rather than task self efficacy. While task self efficacy measures overall confidence to undertake a specific behaviour, barrier self efficacy measures confidence in being able to maintain a behaviour despite the existence of specific barriers (Blanchard, Rodgers, Courneya, Daub, & Black, 2002). This type of self efficacy has also been referred to as self regulatory self efficacy (Bandura, 1997).

Both Reid and colleagues (2007) and Blanchard and colleagues (2009) measured task self efficacy, rather than barrier self efficacy, in their studies of PMT in patients with CHD. This difference in the operationalisation of self efficacy makes it difficult to compare results from the current study with other studies of PMT in patients with CHD. Fortunately, like the current study, both Tulloch and colleagues (2009) and Plotnikoff and Higginbotham (1998) measured barrier self efficacy.

Once again however differences arose between studies in Likert scale ranges. Plotnikoff and Higginbotham (1998) used a five-point Likert scale for self efficacy response options, as used in the current study, while Tulloch and colleagues (2009) used a seven-point Likert scale for this measure. Variation in Likert scale range limits direct comparison of the self efficacy scores of the current study with those of Tulloch and colleagues (2009). Examination of the scale range reveals that while the self efficacy scores of the current PCI patients were at the high end of the scale range at both time-points, those reported by Tulloch and colleagues (2009) were only at the mid-point of the scale range at both time-points. This indicates that the PCI patients in the current study had higher levels of exercise self efficacy than that of the patients with CHD, in the study by Tulloch and colleagues (2009). However, direct comparison of six month self efficacy scores of the current sample with those reported by Plotnikoff and Higginbotham (1998) indicated that both diet and exercise self efficacy scores were similarly high across the two studies. This finding is not readily explainable. It may be that cultural factors affect the expression of barrier self efficacy. While patients in the current study and in the Plotnikoff and Higginbotham (1998) study were Australian, the patients in the study conducted by Tulloch and colleagues (2009) were Canadian. It is possible that self efficacy may be affected by cultural factors, with Australian patients more readily confident about their ability to overcome barriers. On the other hand, other differences between study samples may account for observed differences in self efficacy.
Interestingly, the results of the current study showed that the pattern of change in self efficacy differed, depending on whether dietary or exercise self efficacy was under investigation. In the current study, while dietary self efficacy increased over the six months of the study, there was no overall increase in exercise self efficacy over time. This finding differs from that reported by Tulloch and colleagues (2009) who noted an increase in exercise self efficacy over time in their sample. It is evident that there is much uncertainty over the pattern of change in exercise and dietary barrier self efficacy over time in patients with CHD. Attempts to explain differences between studies in the pattern of change in self efficacy over time would appear to be premature at the current time.

6.2.3 Change over time in emotional appraisal

The emotional appraisal measure of distress regarding thoughts of a future cardiac event was the only PMTplus component that decreased over time. Patients’ level of distress when they thought about the possibility of a future MI appeared to be less overwhelming six months after the event, compared with shortly after the PCI. It is common for patients to be highly concerned about the prospect and the consequences of a future cardiac event, particularly shortly after hospital discharge (Higgins, et al., 2007). This concern, often described as death anxiety (Arndt, Routledge, & Goldenberg, 2006; Bozo, Tunca, & Simsec, 2009), tends to ameliorate over time as patients become less focused on their cardiac event (Sotile, 1996). The reduction in future distress over time, evident in the results of the current study, alongside increased perceptions of threat, appear to be part of the process of coming to terms with the reality of living with a serious, life-threatening illness.

It was unfortunate that this emotional appraisal scale had a large amount of missing data. The items on this scale asked about patients’ emotional reactions to thoughts of a future cardiac event. Missing data were mostly a result of refusal to answer the questions regarding patients’ emotional response to a future event, probably due to its confrontational nature. The reluctance of some patients to even contemplate the prospect of a future cardiac event is interesting. Alsen and colleagues (Alsen, Brink, & Persson, 2008) found that patients with CHD differed in their willingness and ability to be reflective about their illness. More reflective patients spent time contemplating their illness and its meaning. In contrast, patients who were less reflective attempted to avoid all thought about their illness. The patients who were reluctant to respond to
questions regarding possible future cardiac events may have been of this less reflective ilk, who wished to avoid confronting thoughts about their illness.

6.2.4 Summary of changes over time in PMTplus factors

Overall the results of the current study highlight the process of adaptation that PCI patients undergo over time. Both threat appraisal and coping appraisal were subject to change over time. Threat appraisal increased over time as patients came to terms with the seriousness of their disease. Coping appraisal also increased over time as patients realised that there are effective coping actions to manage their disease that they are capable of adopting.

Interestingly, although most cognitive appraisals increased in intensity over time, emotional appraisals decreased in intensity with the passage of time. PCI patients reported reduced distress regarding thoughts of a future heart attack over time, with such thoughts evidently becoming less salient over time. Overall, these findings of change in cognitive and emotional appraisals have clinical implications, in that clinicians need to keep in mind the dynamic nature of both cognitive appraisals and emotional appraisals in order to deliver patient-centred interventions. Interventions shortly after a PCI may need to focus on helping patients to manage their degree of distress regarding a future cardiac event, whereas later interventions may need to help patients to utilise their cognitive appraisals to support behaviour change.

6.3 Change over time in health behaviours

6.3.1 Physical activity

The National Heart Foundation of Australia recommends at least 150 minutes of moderate physical activity weekly, with walking recommended as an ideal way to meet these recommendations (National Heart Foundation of Australia, 2007). Results of the current study showed that at baseline, the majority of PCI patients did not meet this recommendation, with one third not walking for exercise at all. At the six month follow-up, slightly less than half of the PCI patients in the current study were walking daily, with almost one quarter not walking at all. Fernandez and colleagues (Fernandez, et al., 2006) similarly found that less than half of PCI patients were sufficiently physically active at follow-up, twelve months after their event. Likewise, Brandstrom and colleagues (Brandstrom, Brink, Grankvist, Alsen, Herlitz, & Karlson, 2009) in a study of physical activity in STEMI patients, also found that less than half of the patients studied were sufficiently physical active at follow-up (Brandstrom, et al., 2009). It
appears that the level of physical activity of the PCI patients in this study was comparable to that found in both STEMI and PCI patients.

Results of the current study showed increased walking over time. PCI patients in the current study increased the number of times that they walked every week over the six months of the study. This was not merely due to patients overcoming the limitations placed on them by their symptoms at Time one (T1). Patients were asked about their physical activity prior to the PCI. Those who were limited by symptoms immediately prior to their PCI were asked about their walking behaviour before they were limited by symptoms of CHD. This increase over time in walking behaviour indicates that overall the PCI patients in the current study had made some effort to improve their risk profile.

6.3.2 Saturated fat intake

Results of the current study showed that overall levels of saturated fat intake did not change over time for this group of PCI patients. It is worth noting that saturated fat consumption was fairly low in these PCI patients. The mean score observed at both time-points was around one third of the possible total score for saturated fat consumption. The limited range of scores for saturated fat consumption at both time-points suggests that following PCI, patients were already limiting their saturated fat intake. This finding is supported by findings from a study by Murphy and colleagues (Murphy, et al., 2006) who found lower levels of both unsaturated and saturated fat consumption in patients after a cardiac event compared with population norms. It appears that cardiac patients are heeding the messages to reduce dietary fat intake after an event.

6.4 Impact of CR attendance on changes in PMT plus variables and health behaviours

The results of the current study showed that CR attendance did not influence threat appraisal in terms of patients’ perceptions of either the severity of their disease or their personal vulnerability to a future event. For the PCI patients in the current study, perceptions of both severity and vulnerability increased over time, regardless of CR attendance status. This is somewhat surprising, given that much of the content matter addressed within CR sessions relates both to the seriousness of CHD and to patients’ personal vulnerability to a further event (Goble & Worcester, 1999). Patients are generally informed in CR that, firstly, their disease can have severe consequences and, secondly, that vulnerability to further events can be reduced through the adoption of specific changes in diet and physical activity habits (Goble & Worcester,
The lack of an impact of CR on threat appraisal in the PCI patients in the current study may have occurred because CR does not specifically address the needs of PCI patients. It may be that the information delivered in CR sessions regarding severity and vulnerability may not feel personally relevant to PCI patients. It is worth noting that CR programs were initially developed for patients who had experienced a STEMI in the days prior to the existence of the PCI (Goble & Worcester, 1999). Conclusions can not be drawn as to whether this lack of impact of CR on threat perception is characteristic of PCI patients or of patients with CHD in general as this area has not been well studied. It may be that increased threat perception over time occurs regardless of CR in all patients groups, not just in PCI patients as was reported in the current study.

In terms of coping appraisal, for response efficacy the pattern is the same as was evident for the threat appraisal variables. Both dietary and exercise response efficacy increased over time, regardless of CR attendance. Information regarding the effectiveness of both dietary and exercise behaviour change is routinely given to patients as a standard part of CR (Goble & Worcester, 1999). Given this, it might be expected that CR attendance would have an impact on the pattern of change in response efficacy over time. However, in the current study, the increase in response efficacy occurred irrespective of CR attendance, with similar increases observed for both attenders and non-attenders. The lack of an impact of CR attendance on response efficacy may, at first, appear surprising. However, CR programs are only one of many sources of information available to patients. In reality, patients commonly receive advice from a multitude of sources, formal and informal, solicited and unsolicited (Gentz, 2000). It is possible that patients who did not attend CR may have actively sought such advice elsewhere, which may account for the lack of impact of CR on response efficacy.

Interestingly, in the current study the increase in dietary self efficacy occurred regardless of CR attendance, while exercise self efficacy interacted with CR attendance over time. The exercise self efficacy of the PCI patients who attended CR increased over time while that of non-attenders decreased over time. To assist understanding of the interaction between CR and self efficacy, it would seem important to understand what CR offers and how CR might affect both dietary and exercise self efficacy. As previously mentioned, the self efficacy measured in this study is known as ‘barrier self efficacy’ which measures confidence in being able to maintain a behaviour despite the existence of specific barriers (Blanchard et al., 2002).
Bandura (Bandura, 1997) states that there are four key sources of barrier self efficacy: performance experience; verbal persuasion; physiological arousal and vicarious experience. It can be surmised that attending CR would have impacted on all four key sources of exercise self efficacy. First, patients who attend CR undergo a ‘performance experience’, whereby they engage in a range of physical activities each time they attend CR (Briffa, Kinsman, Maiorana, Zecchin, Redfern, Davidson, Paull, Nagle, & Denniss, 2009). Second, patients who attend CR are subject to ‘verbal persuasion’ regarding the benefits of physical activity and their own capacity to engage in activities (Goble & Worcester, 1999). This ‘verbal persuasion’ usually occurs within the context of the weekly exercise session as well as within at least one education session. Third, patients who attend CR are taught to interpret their own ‘physiological arousal’ cues that arise during exercise (Goble & Worcester, 1999). This knowledge of physiological arousal cues helps patients to differentiate between normal effects of physical activity and symptoms of their disease. Finally, CR attenders have an opportunity for ‘vicarious experience’ at every CR session. They have the opportunity to observe others, similar to themselves, being physically active and overcoming barriers to physical activity (Briffa, et al., 2009). Given that CR attenders are exposed to all four key sources of barrier self efficacy for exercise, it is not surprising that exercise self efficacy of CR attenders improved over time.

The results of the current study showed that improvement in dietary self efficacy over time occurred regardless of CR attendance. Other studies have similarly found a lack of impact of CR on dietary self efficacy (Lau-Walker, 2006). It appears that CR programs are less effective at addressing these four key sources of dietary self efficacy, namely performance experience, verbal persuasion, physiological arousal and vicarious experience. Patients attending CR have a limited exposure to ‘performance experience’ to improve dietary self efficacy. This ‘performance experience’ is often limited to one brief education session where patients practise reading food labels (Goble & Worcester, 1999). Patients also have a limited exposure to ‘verbal persuasion’, usually through a didactic education session about fat in food (National Heart Foundation of Australia, 2002). In addition, within CR, patients are generally not taught to correctly interpret ‘physiological arousal’ in terms of hunger cues (National Heart Foundation of Australia, 2002). Furthermore, patients in CR have few opportunities for ‘vicarious experience’ as CR programs generally do not include opportunities to learn how others overcome barriers to eating a low fat diet (Goble & Worcester, 1999; National Heart Foundation of Australia, 2002). Given all this, it is not surprising that the exercise self efficacy of CR attenders improved over
time, while changes in dietary self efficacy occurred regardless of CR attendance. Importantly, it needs to be remembered that CR attenders are a self selected group and change over time can not be directly attributed to attendance.

Change over time in distress regarding a future MI also occurred regardless of CR attendance. Patients’ level of distress regarding a future MI decreased over time for both non-attenders and attenders. This finding is not surprising given that CR was not designed to impact on this variable (Goble & Worcester, 1999).

Interestingly, the PCI patients in the current study increased their walking over time, regardless of CR attendance. Both CR attenders and non-attenders increased their physical activity over the six months of the study. Much evidence exists around the benefits of attending CR on increasing physical activity over time (Dendale, Berger, Hansen, Vaes, Benit, & Weymans, 2005; Goble & Worcester, 1999; Taylor, et al., 2008). The lack of an effect for CR did not mean that CR was ineffective. It is apparent that the PCI patients who attended CR were less active than those who did not choose to attend. This finding is in contrast to other studies which have found that less physically active patients with CHD were less likely to attend CR (Worcester, et al., 2004). This tendency for the less active to avoid CR may not be the case with PCI patients. The more active PCI patients in the current study may have believed that they had little need to attend CR, possibly due to the rapid improvement in functional status experienced by many patients after PCI (Allen, Fitzgerald, Swank, & Becker, 1990). On the other hand, the tendency for the less active patients to attend CR could have reflected a bias in referral procedures. Less active patients may have been proactively recruited to CR at the expense of the more active patients. The institution of effective referral procedures can reduce such tendencies for bias in the referral of patients to CR (Higgins, et al., 2008).

Our results showed that CR attendance had a beneficial impact on saturated fat consumption. CR attenders decreased their saturated fat intake over time while non-attenders increased their intake over time. This apparent beneficial effect of CR attendance on saturated fat intake was not surprising. CR attenders receive considerable education regarding the perils of saturated fat consumption and the identification of foods containing saturated fat (Goble & Worcester, 1999; National Heart Foundation of Australia, 2002). This increased knowledge may have led to decreased saturated fat consumption over time in CR attenders. Improvements in the level of saturated fat consumption over time has been found in other studies of CR participation.
(Koikkalainen, Mykkanen, Julkunen, Saarinen, & Lappalainen, 2002; Timlin, Shores, & Reicks, 2002; Yates, Heeren, Keller, Agrawal, Stoner, & Ott, 2007). In one follow-up study of a rehabilitation intervention, patients were found to be continuing to avoid high fat foods, such as French fries, up to three years after their cardiac event (Twardella, Hahmann, Wusten, Rothenbacher, & Brenner, 2006).

In summary, CR attendance had little impact on PMTplus factors with change over time in these factors mostly occurring regardless of CR attendance. The exception to this was exercise self efficacy which increased over time in CR attenders and decreased over time in non-attenders. It appears that specific features of CR programs may directly impact on exercise self efficacy. In terms of health behaviours, while increased physical activity occurred regardless of CR attendance, CR appeared to have a positive impact on saturated fat intake in the PCI patients in the current study.

6.5 Impact of diagnostic group on PMTplus variables and health behaviours

Patients in the STEMI or non-STEMI group did not rate their severity or vulnerability higher than patients who had been diagnosed with SA. This might at first seem surprising, as patients diagnosed with STEMI or non-STEMI would have experienced more severe and unpredictable symptom presentation than patients diagnosed with SA. However, this finding is in line with a previously mentioned study that found that objective indicators of severity of CHD were largely unrelated to patients’ own perceptions of the severity of their CHD (Petrie, et al., 1996).

The PCI patients in the current study had different symptomatology driving their admission to hospital to undergo the procedure. Patients who had had STEMI or non-STEMI would have had greater pain and less controllability of symptoms, than patients who had experienced SA prior to hospital admission (Jackson & Goble, 2002). Patients with a history of SA are generally offered PCI as a non-urgent intervention, whereas PCI is often an urgent intervention for patients who have had STEMI or non-STEMI (Jackson & Goble, 2002). While the symptomatic experience of patients who had had an episode of ACS would have been vastly different to that of patients diagnosed with SA, diagnostic group did not impact on any of these PMTplus factors. In addition, diagnostic group did not impact on change over time in either physical activity or saturated fat intake. It appears that the pattern of change over time was similar for all PCI patients, regardless of diagnostic group. It appears that PCI patients may be
more similar than they are different. Importantly, the exclusion criteria applied may have increased the homogeneity of the present study group, perhaps exaggerating this effect.

6.6 Relationships between the variables

The results of the current study showed that the majority of the PMTplus correlations were small to moderate. Consistent correlations between the coping appraisal variables were found in the current study. More specifically, change in exercise response efficacy was associated with change in exercise self efficacy, and change in dietary response efficacy was associated with change in dietary self efficacy. Similarly, Plotnikoff (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) found significant correlations between coping appraisal measures, measured six months after a cardiac event, for both the exercise and dietary variables. Blanchard and colleagues (2009) also found consistent correlations between coping appraisal variables at baseline and also at three month follow-up.

In the current study, there was a significant association between the threat appraisal measures of severity and vulnerability, specifically between change in severity and change in dietary but not exercise vulnerability. Likewise, Plotnikoff (1994) also found associations between severity and dietary but not exercise vulnerability. On the other hand, significant correlations between severity and exercise vulnerability were reported by Blanchard and colleagues (2009).

Interestingly, in the current study, associations between the opposite appraisals of threat and coping were evident, with some associations marked between vulnerability measures and coping appraisal measures. Specifically, associations were evident between change in dietary vulnerability and change in dietary response efficacy and also between change in exercise vulnerability and change in exercise response efficacy. This is in contrast to the findings of Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) who found no associations between the components of opposite appraisals. The correlation between response efficacy and vulnerability in the current study may be explained by the use in the current study of a conditional risk measure of perceived vulnerability rather than a measure of unconditional vulnerability. It appears that, while this measure of perceived vulnerability adheres more closely to Roger’s (1975) original definition of perceived vulnerability, the
associations between the threat and coping components of the model are increased when a conditional measure of perceived vulnerability is used.

Results of the current study showed associations between increased perceptions of severity and increased perceptions of distress regarding a future MI. It was not entirely surprising to find that change in distress regarding a future MI was associated with change in severity. As patients rated their own cardiac event as more severe over time, they were correspondingly more concerned by thoughts about the prospect of a future cardiac event. In addition, distress was negatively correlated with dietary self efficacy. Increased distress regarding a future cardiac event was associated with decreased dietary self efficacy. It may be that reduced dietary self efficacy leads to greater levels of distress regarding a future event.

Associations between the PMTplus variables and the outcome health behaviour measures were particularly interesting. Increased physical activity over time was associated with increased exercise self efficacy over time and reduced distress regarding a future event over time. Similar associations between these PMTplus variables and walking were also evident at baseline. Higher self efficacy and lower distress regarding a future MI at baseline were associated with increased walking at baseline. At follow-up, while higher self efficacy remained associated with increased walking, higher exercise response efficacy at follow up was also associated with increased walking at follow up. The threat appraisal variables of severity or vulnerability were not significantly associated with walking at either time-point, nor were they associated with change in walking over time.

A different pattern of relationships was evident between the PMTplus variables and saturated fat intake. In particular, associations between threat appraisal variables and saturated fat intake were evident. Reduced saturated fat intake over time was associated with both reduced vulnerability over time and increased dietary self efficacy over time. At baseline, both of the threat appraisal variables of severity and vulnerability were associated with saturated fat intake. Lower severity and lower vulnerability at baseline were associated with lower saturated fat consumption at baseline. In addition, higher dietary self efficacy was also associated with lower saturated fat intake at baseline. Interestingly, at follow-up, only higher self efficacy was associated with lower saturated fat intake.
While the pattern of association between PMT<sub>plus</sub> variables and health behaviours is interesting, regression analyses were required to determine the unique contribution of these PMT<sub>plus</sub> predictor variables to change in both dietary and exercise behaviour.

6.7 Testing of PMT<sub>plus</sub> model

The second aim of this thesis was to test the utility of the PMT<sub>plus</sub> model to predict lifestyle change, both saturated fat intake and walking, over six months in PCI patients undergoing a first revascularisation procedure. In view of the limited, longitudinal data available on this population, the data collected in this study makes a contribution to the literature in this area. This study will assist in the identification of important and modifiable determinants of both low fat diet and exercise behaviour in PCI patients. The approach used in the current study has been to identify whether changes in predictor variables were predictive of changes in the outcome health behaviours. The results from testing of the PMT<sub>plus</sub> model will enable a greater understanding of behaviour change in PCI patients. The PMT<sub>plus</sub> model could provide a framework to guide the development of interventions which address the health behaviours of patients treated with PCI. In addition the model testing informs current research on social cognitive theories of behaviour change and gives a theoretical basis for future interventions for PCI patients.

Overall the results of the present study suggest that two PMT<sub>plus</sub> variables were important predictors of increased walking in PCI patients following first PCI. These variables were (1) increased exercise self efficacy, and (2) decreased distress regarding a future MI. In addition, two PMT<sub>plus</sub> variables were important predictors of decreased saturated fat intake in PCI patients following first PCI. These variables were (1) increased dietary vulnerability, and (2) increased distress regarding a future MI.

6.7.1 Threat appraisal and change in walking

The results of the regression analysis showed that while changes in the coping appraisal variable of self efficacy and the emotional appraisal variable of distress regarding a future MI were predictive of change in walking. The threat appraisal variables of severity and vulnerability were not predictive of change in walking. In the current study, the unique contribution of threat appraisal variables to the prediction of walking was miniscule. In addition, correlations also demonstrated a lack of significant relationships between threat appraisal variables and walking.
at either time-point in this sample of PCI patients. Although contrary to theory, this finding is consistent with previous studies of PMT and exercise outcomes in patients with CHD (Blanchard et al., 2009; Godin et al., 1991; Plotnikoff & Higginbotham, 1998) and with meta-analyses of PMT studies which addressed multiple health protective behaviours (Floyd, et al., 2000; Milne, et al., 2000). Likewise, Tulloch and colleagues (2009) also found that vulnerability was not a significant predictor of either exercise intention or exercise behaviour. While severity was predictive of exercise intention, it was not predictive of exercise behaviour. It may be that the experience of having CHD raises the level of threat perception experienced by all members of a patient group, which would reduce the overall impact of threat appraisal variables. Interestingly, Reid and colleagues (Reid, et al., 2007a) reported that CHD patients who reduced their level of physical activity over time were likely to have higher levels of exercise vulnerability. This finding by Reid and colleagues (2007) of higher risk predicting worsening of the health behaviour is also contrary to PMT. It appears that that excessive risk appraisal may create a disincentive to exercise rather than an incentive in patients with CHD.

The results of the regression analysis in the current study, which point to the lack of a statistically significant relationship between change in threat appraisal and change in physical activity in PCI patients, supports previous work by Kimble (1998). Kimble (1998) also found that threat appraisal was not predictive of physical activity in a sample of PCI patients. Speculations that PCI patients, in particular, fail to change their exercise behaviour due to inadequate perceptions of threat (Gentz, 2000; Kimble & King, 1998) were not supported by the results of the current study. Concerns about low levels of threat perceptions in PCI patients have been largely expressed by clinicians (Gentz, 2000; Kimble & King, 1998). The reasoning that appears to underlie this concern is that, because PCI is minimally invasive and linked to immediate symptomatic relief, patients are unrealistically optimistic and therefore less likely to make lifestyle changes (Gentz, 2000; Kimble & King, 1998). This reasoning may indicate a belief that PCI patients have not experienced a sufficient degree of suffering, with suffering seen as a necessary impetus for behaviour change. It is important that clinicians are made aware of the limited role of threat perception, both perception of severity and perception of personal vulnerability, in the prediction of physical activity behaviour change in PCI as well as other cardiac patients. In addition they need to also be aware that heightened threat perception can be a barrier to maintaining physical activity as reported by Reid and colleagues (2007). These findings suggest that health education for patients with CHD need not be as highly focused on
increasing patients perceptions of threat, as currently occurs in many CR programs (Goble & Worcester, 1999).

### 6.7.2 Threat appraisal and change in saturated fat intake

In terms of the threat appraisal variables, the results of the regression analysis showed that while increased dietary vulnerability was predictive of increased saturated fat intake, change in severity was not predictive of change in this dietary measure. Results from the current study showed that change in patients’ perception of the severity of their CHD did not have a significant influence on change in saturated fat intake. Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) in a study of patients with CHD, also failed to find that patients’ perception of the severity of their CHD was predictive of dietary outcomes. However, results of the current study did demonstrate that increases in the threat appraisal variable of dietary vulnerability significantly predicted increased saturated fat intake over time. Dietary vulnerability was a measure of patients’ belief in their vulnerability to a further event if they did not change their diet. The current findings indicate that increased dietary vulnerability over time was predictive of increased intake of saturated fat over time. Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995) also reported that dietary vulnerability was predictive of stage of change in following a low fat diet, but this relationship was in the opposite direction to the findings of the current study. Interestingly, Plotnikoff and Higginbotham (1998) found that higher dietary vulnerability was predictive of dietary stage of change but not of intention to follow a low fat diet. There are major differences in dietary outcome measures between the current study, which measured actual (self reported) dietary behaviour change, and the study conducted by Plotnikoff and Higginbotham (1998) which measured dietary intentions and stage of change. It may be that different factors predict actual dietary behaviour to those that predict intention to change.

The finding that higher perceptions of vulnerability influenced poorer dietary behaviour over time is not unprecedented. Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1995) revealed similar findings in their study of low fat diet intentions and behaviours for the prevention of CHD in a community sample. In addition, comparable negative correlations have also been reported in correlational studies (Kegeles & Lund, 1982; Seydel, Taal, & Wiegman, 1990). The influence of increased vulnerability on poorer dietary behaviour may arise through the adoption of a ‘defensive avoidance’ (Seydel,
et al., 1990) style of coping by those who feel most vulnerable to a disease. It may at first appear that the finding of an association between increased dietary vulnerability and increased saturated fat intake is in direct contrast to what would be predicted by PMT. However, Sturges and Rogers (1996) have previously argued that increased threat arousal, which is not accompanied by a coping behaviour, may lead an individual to adopt a position of helplessness and passivity in response to a threat. As the PCI patients in the current study were at a very early stage of adaptation to their disease, they may have experienced the PCI as an overwhelming threat and may have had limited resources to cope with this threat. Thus, the influence of dietary vulnerability on increased saturated fat intake in PCI patients undergoing a first revascularisation procedure may reflect feelings of helplessness and resignation in the face of an overwhelming threat. It is not uncommon for people faced with knowledge about overwhelming risk to experience powerlessness about reaching their goals with the effect of this being that individuals simply ‘give up’ on their goals (Bach Nielsen, Dyhr, Lauritzen, & Malterud, 2005). In addition, the experience of higher vulnerability may lead patients to indulge in what is commonly known as ‘comfort eating’, whereby high saturated fat food is used to distract the eater from their own distressing thoughts (Brogan & Hevey, 2009). Indeed, a biological basis for comfort eating has been recently outlined to explain why increased intake of saturated fat assists in managing such stress (Dallman, Pecoraro, & la Fleur, 2005). Reasons for the influence of increased vulnerability on poorer dietary behaviour can only be extrapolated. Further research would be required prior to drawing conclusions as to what underlies this relationship. Regardless, these findings suggest that health education programs for PCI patients need to pay attention to managing the impact of information which may influence threat appraisal.

6.7.3 Coping appraisal and change in walking

Results of the current study showed that change in walking behaviour was predicted by change in exercise self efficacy. Increased exercise self efficacy over time predicted increased walking in PCI patients. In this regard, the present findings, regarding the importance of self efficacy in the prediction of walking, reinforce previous observations of the broader group of patients with CHD (Blanchard, et al., 2009; Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998; Reid, et al., 2007a; Tulloch, et al., 2009a). The findings of the current study that increased exercise self efficacy over time predicted increased walking over time is supported by research
which has found that change over time in self efficacy was predictive of change in health behaviours (Scholz, Nagy, Goehner, Luszczynska, & Kliegel, 2009). Analysing change in cognitive predictors allows the examination of the influence of such changes on health behaviours. Previous researchers have shown that self efficacy about being able to increase physical activity predicts actual physical activity after a cardiac event (Luszczynska, Sarkar, & Knoll, 2007). This suggests that interventions for PCI patients, which target the cognitive predictor of exercise self efficacy, would improve walking behaviour. The findings in the current study that CR attenders exercise self efficacy increased over time suggests that CR is an effective intervention to promote physical activity in PCI patients.

The findings of the current study suggest that change in exercise response efficacy does not influence change in walking behaviour. It is apparent that, in this sample of PCI patients, increased exercise response efficacy over time did not significantly predict change in walking behaviour over time. Similarly, Plotnikoff and Higginbotham (1998) also failed to observe a significant relationship between exercise response efficacy and physical activity. Likewise both Tulloch and colleagues (2009) and Blanchard and colleagues (2009) reported that exercise response efficacy did not predict exercise behaviour. These findings do not necessarily mean that response efficacy is unimportant in patients with CHD. Instead, these results may indicate a threshold effect, where further increases above a threshold did not add to the prediction of exercise behaviour. In fact, exercise response efficacy was found to be predictive of improvement in exercise stage of change (Reid, et al., 2007a) and of exercise intentions (Blanchard et al., 2009; Tulloch et al., 2009).

6.7.4 Coping appraisal and change in saturated fat intake

Results from the current study showed that changes in the two coping appraisal measures of dietary response efficacy and dietary self efficacy were not significant predictors of change in saturated fat intake over time. In terms of dietary response efficacy, these results correspond to Plotnikoff and Higginbotham’s (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) study which showed that dietary response efficacy was not predictive of low fat diet intentions. This lack of influence of dietary response efficacy on outcome dietary measures in CHD patients, while contrary to PMT, could be due to a threshold effect in the patient population. It may be that once a threshold for dietary response efficacy has been reached, additional benefits may not be gained by further increases in dietary response efficacy.
It was somewhat surprising that increased dietary self efficacy did not contribute to reduced saturated fat intake in the current study, especially given previous findings in cardiac patients (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998). Importantly, while the outcome measure for the current study was a measure of dietary behaviour change, Plotnikoff and Higginbotham (Plotnikoff, 1994; Plotnikoff & Higginbotham, 1998) used intention to change as their dietary outcome measure. While patients may have strong intentions to change which may be related to self efficacy, actual behaviour change may be more difficult to achieve. It is important to acknowledge the difficulties that many patients face when attempting to change their dietary behaviour. Eating behaviour is often elicited automatically in response to powerful internal or external cues (Kindermann, 1980). Reduction of saturated fat intake requires a continual level of mindfulness of a behaviour which is often habit driven (Koikkalainen, et al., 2002; Nieuwenhuijsen, Zemper, Miner, & Epstein, 2006; Shmueli & Prochaska, 2009; Timlin, et al., 2002; Yates, et al., 2007). It may be that actual dietary behaviour change may present a considerable challenge to the patient, which increased dietary self efficacy alone may not be sufficient to overcome.

### 6.7.5 Change in distress regarding a future MI and change in health behaviours

The results of the current study indicate that change over time in the emotional appraisal variable of distress regarding a future MI predicted change over time in both physical activity and saturated fat intake. This finding that affective considerations, at least partially determined health behaviour change is not surprising, given that this accords with previous work in this area (Leventhal & Cameron, 1987). Indeed, in the current study, the contribution of emotional appraisal to behaviour change was stronger than that of most of the PMT cognitive variables. This finding supports previous research which has suggested that the influence of emotional appraisals on behaviour change could be even stronger than the influence of cognitive appraisals (Breckler & Wiggins, 1989).

Of great interest was the finding that increased distress over time predicted both reduced saturated fat intake and reduced walking. Patients whose distress regarding a future cardiac event increased over time were more likely to reduce their saturated fat intake over time but were also more likely to decrease their walking over time. These results are in line with previous research which has suggested that emotional appraisals can both help (Easterling & Leventhal, 1989; Millar & Millar, 1993) and hinder (Carney, et al., 1995; Zeigelstein, et al., 2000) health
behaviour change. It may be that high levels of distress regarding a future cardiac event reflect underlying death anxiety, which is not uncommon in patients with CHD (Higgins, et al., 2007; Mohan & Nirmala, 1987). Research in this area supports these results, in that health behaviour change has been shown to both improve and worsen in response to concern about mortality (Arndt, et al., 2006; Bozo, et al., 2009).

6.7.5.1 Change in distress regarding a future MI and change in walking

The current results showed that increased levels of distress regarding a future cardiac event predicted reduced walking over time. In considering this apparently incongruous finding, it is important to explore how physical activity is viewed by patients with CHD. Patients with a high level of distress regarding a future heart event may adopt a sick role in order to manage their emotional distress (Astin, et al., 2009). The adoption of a sick role implies engagement in minimal levels of physical activity. Some patients may actually view physical activity, such as walking, as inherently dangerous. They may fear that such activity could precipitate the very event that they are most concerned about. It is, indeed, common for cardiac patients to hold misconceptions about the dangers of exercise after a cardiac event and to consequentially avoid physical activity (Furze, Lewin, Murberg, Bull, & Thompson, 2005). In one study of older women’s attitudes, even women who knew the benefits of exercise for their heart reported fears that exercise could cause a heart attack (O'Brien Cousins, 2000). These common lay beliefs about the dangers of exercise in patients with CHD may help explain why increased levels of future distress are associated with decreased physical activity over time.

6.7.5.2 Change in distress and change in saturated fat intake

Interestingly, the influence of distress on saturated fat consumption was in the opposite direction to the impact of distress on walking. Patients whose distress regarding a future cardiac event increased over time were more likely to reduce their saturated fat intake over time. It appears that a certain level of emotional distress regarding a future event may be required to drive improvement in saturated fat intake. Studies of cancer prevention have similarly found that increased levels of distress regarding cancer occurrence were related to consumption of a low fat diet (Bowen, Alfano, McGregor, & Andersen, 2005). This is understandable, given that eating behaviour is often elicited automatically (Kinderman, 1980). Increased levels of emotional distress regarding a future cardiac event may act as a powerful internal cue to manage
eating behaviour. This may assist patients to maintain the level of mindfulness required to achieve a reduction in saturated fat intake.

6.8 Utility of the PMTplus model

Previous research guided by PMT has, to a great extent, focused on cognitive appraisals, while ignoring affective determinants of health behaviour. Consequently, it was expected that the addition of affective components to the PMT model, would result in modest increases in predictive power in the new PMTplus model.

These results showed that the PMTplus model did increase the predictive power of the PMT model for both dietary and exercise behaviour. For both behaviour change variables, the addition of the emotional appraisal measure of distress regarding a future MI added to the ability of the model to predict change in health behaviour. In addition, the emotional appraisal variable of future distress was a significant predictor of health behaviour change for both diet and physical activity, although the directionality of the finding was different for each behavioural outcome. It appears that the PMTplus model provides a useful model of cognitive and emotional appraisal which explains some of the variability in health behaviour change.

6.9 Implications for the development of interventions for PCI patients

Previous studies have found that PCI patients are less likely to change their health behaviours than other patients with CHD (Fletcher, 1986; Gaw-Ens & Laing, 1994; Gaw, 1992; Gulanick, Bliley, Perino, & Keough, 1998; Hanson, 1988). To date, the development of specific interventions for PCI patients to redress this imbalance has been hampered by a limited knowledge of the factors that promote behaviour change in PCI patients. It is important to identify factors which are strongly related to the desired behaviour in the target population, prior to the development of interventions (Baranowski, Anderson, & Carmack, 1998). Knowledge of these factors can then inform interventions for the target population (Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009a). The current results add to the body of knowledge in this area and can be used to guide both the development of new interventions for PCI patients and the adaptation of current interventions for patients with CHD to better meet the needs of PCI patients.

It was apparent from these results that over time, PCI patients go through a process of adaptation to their heart disease. Over time, patients’ perceptions of threat and coping appraisal
may increase, while their level of emotional appraisals may reduce in intensity. Interventions for PCI patients may need to be able to be adaptable in order to support patients as they adjust to the challenge of living with CHD. Menu driven interventions, whereby patients choose the topics on which they wish to focus could provide a method of meeting this need for adaptability. Other studies of interventions for patients with CHD have demonstrated that a menu driven approach to rehabilitation is both acceptable to patients and effective in terms of health outcomes (Redfern, Briffa, Ellis, & Freedman, 2009).

The findings of the current study suggest that the coping appraisal components of PMT had greater influence on exercise behaviour than the theory’s threat appraisal components. In addition, the PMT threat appraisal component of dietary vulnerability had a negative influence on dietary behaviour. To date, many have viewed low levels of threat perception in PCI patients as a factor that was related to reduced levels of behaviour change (Astin, et al., 2009; Faris & Stotts, 1990; Fletcher, 1986; Gaw-Ens & Laing, 1994; Gaw, 1992; Gulanick, et al., 1998; Kimble, 1998). The current research should guide clinicians away from the introduction of interventions to increase threat perceptions. The finding that threat perception increased over time for PCI patients and that change in severity over time was not predictive of change in either exercise or dietary behaviour, could lead to the conclusion that interventions to increase perception of severity in PCI patients would be ineffective. However, the finding that increased vulnerability was associated with increased saturated fat intake over time, suggests that interventions to increase threat appraisal in PCI patients may be counterproductive in promoting dietary change and ineffective in promoting exercise behaviour. It appears that, rather than developing interventions to increase threat perception in PCI patients, considerable caution is required to ensure that interventions assist patients to manage threat perception to ensure that it does not become overwhelming.

The strong role of exercise self efficacy in influencing exercise behaviour change suggests that health education needs to mainly focus on positive coping messages to motivate patients to initiate and maintain exercise behaviour. The finding that CR impacted positively on exercise self efficacy was promising, given that CR is a standard intervention recommended for all patients with CHD (Goble & Worcester, 1999). It was apparent from these findings that CR is an effective intervention to increase exercise self efficacy in patients who have had a PCI. This finding underlines the importance of CR in improving health outcomes of PCI patients.
The lack of a positive effect of CR on dietary self efficacy could mean that that changes to the format of CR dietary education modules are required to extend the capacity of this intervention to build dietary self efficacy in all patients with CHD. Self efficacy can be increased through direct experience of overcoming a barrier, alongside a variety of means including practising or role play, planning and strengths focused interventions (Cramp & Bray, 2009). The incorporation of practical dietary focused activities into CR, such as preparing a low fat dish or practising refusal of high fat dishes may improve the impact of CR on dietary self efficacy.

Interventions developed to support PCI patients will need to be mindful of the important role that the emotional appraisal variable of perception of distress regarding a future MI plays in the prediction of health behaviour change. The central role of perception of distress regarding a future MI in influencing behaviour change requires that interventions be developed to assist patients to manage their level of distress regarding a future cardiac event. Findings of the current study suggested that increased distress could help motivate patients to make positive dietary changes. Interventions for PCI patients could be developed to assist patients to be more consciously aware of their level of distress regarding a future cardiac event, in order to use such distress as a motivator for behaviour change. However, the association of increased distress with reduced walking requires a balance to be negotiated between the positive impact of future distress on dietary behaviour and the negative influence of this variable on exercise behaviour. Concurrent interventions would seem to be required to address exaggerated lay beliefs about the dangers of exercise for patients with CHD. In addition, patients may need to be educated in the correct interpretation and management of any cardiac and non-cardiac symptoms, such as breathlessness, that may arise during exercise. This would help patients to manage somatic signs so they did not become cues for increased distress and consequentially decreased activity.

The finding in the current study that saturated fat consumption increased with increased perceptions of vulnerability, and walking decreased with increased perception of distress regarding a future heart event, points to the importance of providing psychological support to patients alongside advice regarding behaviour change. In particular interventions to address saturated fat intake in PCI patients may need to walk a tight line between keeping vulnerability to a manageable level, while allowing patients to be aware of their concerns regarding a future cardiac event. It appears that clinicians working with PCI patients need to assist patients to maintain optimal arousal. The need to establish a balance between vulnerability and distress
regarding a future MI in order to maximise dietary behaviour change reflects the tenet of the Yerkes-Dodson law which states that optimal arousal is required for optimal performance (Curtin, 1984). The finding in the current study that too high a level of vulnerability could lead to performance decline (increased saturated fat intake), while too low a level of distress regarding a future MI could lead to reduced cues to activate dietary change intentions appears to be in line with Yerkes-Dodson law. The integration of validated models of cognitive-behavioral psychotherapies (Beck, 1976; Ellis, 1962) into current interventions for PCI patients may assist patients to manage distress regarding a future cardiac event and to minimise feelings of helplessness in response to the threat of CHD. In addition such an intervention could also help patients to address faulty beliefs regarding the dangers of physical activity.

6.10 Strengths and limitations

This study has numerous strengths. First, the study has recruited a reasonable sized sample of Victorian PCI patients. The recruitment of patients consecutively admitted for PCI at three large metropolitan hospitals helped to increase the representativeness of the sample. The recruitment procedure, which involved approaching all eligible patients in hospital, minimised the selection bias which would have operated if patients were recruited via CR programs or other avenues. The use of telephone interviewing to collect data enabled the recruitment of patients who did not reside in the metropolitan region and who would be otherwise unable to participate in a face to face interview. The study response rates were acceptable and equivalent to other studies of cardiac patients (Murphy et al., 2008; Worcester et al, 2004). In addition to these factors, the minimal loss of patients between baseline and follow up has assisted in maintaining the size of the sample.

Second, the recruitment of patients undergoing a first revascularisation procedure was study strength. Behaviour change in patients at the earliest stage of disease progression can have major benefits in terms of both morbidity and mortality (National Heart Foundation of Australia, 2007). Understanding factors associated with behaviour change in these patients at the early stage of their disease progression will assist in the development of interventions which target this patient group.

Third, this is one of the first studies to apply PMT, or indeed any theoretical model, to the study of behaviour change in PCI patients. This is also one of the first studies which has attempted to integrate a conceptualisation of emotional appraisal broader than Roger’s original
fear appraisal concept, alongside the cognitive appraisals included in PMT. While specific interventions have been needed for this patient group, due to the low level of reported behaviour change, the development of interventions has been hampered by the atheoretical approach adopted to the investigation of behaviour change in PCI patients. In addition to these factors, the use of a longitudinal design has allowed us to examine change in cognitive appraisals and change in emotional appraisals over time, alongside change in health behaviours.

Finally, while researchers have utilised PMT to understand exercise behaviours in patients, few have included dietary measures in these studies. As such, the application of PMT to the study of dietary behaviour in patient groups is in its infancy. This study will make an important contribution to the limited literature in this area. Through the identification of variables to be targeted in the development of dietary intervention, researchers may develop relevant intervention programs that are tailored to patient needs.

While the study response rates were pleasing, a minority of potential participants were lost to the study prior to the point of recruitment, usually due to early hospital discharge precluding an attempt to recruit the patient to the study. While this was unfortunate, it was not surprising given that PCI patients may be discharged within 24 hours of the procedure. The loss of a substantial minority of patients following recruitment was somewhat disappointing. This occurred when the researcher was unable to contact the patient for the initial telephone interview after the patient’s hospital discharge. Patients can be quite mobile in their residence following hospital discharge, This may help to explain the inability of the researcher to make contact. However, this loss to follow up could have been avoided by conducting the initial interview in hospital immediately following recruitment. This protocol has been used in other studies which have recruited patients after a cardiac event (Murphy et al., 2006; 2008). In addition the need to exclude a high number of patients due to their limited English was disappointing but not surprising. The hospitals at where patients were recruited from had high numbers of patients from culturally and linguistically diverse backgrounds. The use of interviewers who were able to speak community languages would have reduced this high rate of exclusion but would need to be balanced with possible loss of rigour due to the need to translate the interview schedule into a variety of languages if this approach was used.

In addition to these numerous strengths, limitations should also be acknowledged. First, the loss of data due to participants’ reluctance to answer questions regarding level of distress
aroused by thoughts of a future MI was a serious limitation. The loss of a substantial number of participants due to missing data on this question reduced the statistical power of the study.

In addition, the exclusion of the data from patients who refused to answer this question could have potentially meant that the results would be applicable only to PCI patients who were more amenable to answering challenging questions. Fortunately, this issue of loss of data were largely limited to one interviewer, with the second interviewer evidently able to encourage responses from the majority of patients. This has prevented the entire study from being compromised.

Second the small number of female patients did not allow for gender comparisons to be made. This will be an important issue to consider in future studies which use PMT. Blanchard and colleagues (2002) in a study of patients with CHD reported that gender influenced change in self efficacy over time (Blanchard, et al., 2002). In addition, low numbers of current smokers in the sample meant that PMT variables could not be used to understand smoking behaviour in PCI patients. This is an important area for future research, given that smoking cessation is a powerful predictor of both mortality and morbidity in PCI patients (Lisspers, Sundin, Ohman, Hofman-Bang, Ryden, & Nygren, 2005). In order to study this additional behaviour, a sample of patients who have been smokers in the twelve months preceding hospitalisation would need to be recruited.

Third, there were some problems with instrumentation in a number of the measures used. An inaccurate definition of a low fat diet was read to patients prior to questions regarding perceived vulnerability to a further heart event if a low fat diet was not adopted. It is possible that this may have influenced some patients’ responses to the dietary vulnerability items. There were also a number of problems in the measurement of physical activity. The item used to measure walking did not identify whether the intensity of this activity was light, moderate or vigorous. The addition of information on intensity would have enabled a more accurate estimation of level of exercise. In addition, the use of self report measures of exercise may have also led to an inaccurate estimation of actual exercise behaviour. Of further concern was the limitation of the measure of physical activity to the number of weekly walking episodes greater than twenty minutes. This may have led to an underestimation of physical activity in patients who went for very long walks. The exclusion of physical activity other than walking may also have resulted in an underestimation of physical activity in some patients. These issues could
have been addressed through the use of a questionnaire designed to measure physical activity in older adults. Such an instrument would have been preferable to the single item measure of walking behaviour used in the current study. Alternatively, rather than rely on self report data, future studies could use accelerometers or pedometers in order to obtain objective exercise data. In addition, there were differences in time referents between the self efficacy measures at six month follow up and the six month behaviour assessment. Time referents for the self efficacy measures should have been framed within the past six months to align with the six month behaviour assessment. A further issue with instrumentation was the use of single item measures for the threat appraisal construct of severity and also for the both dietary and exercise response efficacy variables. This limited the potential responsiveness of these measures to change and also turns these complex concepts into uni-dimensional constructs. However, the measurement of both dietary and exercise self efficacy was appropriate and the use of conditional vulnerability measures was advantageous over traditional, unconditional vulnerability measures commonly employed in PMT research. The inclusion of items to measure beliefs regarding exercise could assist in understanding the relationship between increased distress regarding a future cardiac event and decreased walking in this patient group.

Finally, the inclusion of a measure of anxiety and depression, such as the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983) could have increased the understanding of relationships between vulnerability, distress regarding a future event and behaviour change in patient groups. Levels of both anxiety and depression are commonly high in patients with CHD (Murphy, et al., 2008). The inclusion of such a measure might enable a greater understanding of the role of vulnerability in dietary behaviour change.

6.11 Conclusions

In summary, this thesis reports results of a prospective study which investigated cognitive appraisals, emotional appraisals and behaviour change in PCI patients. Interestingly, it appears that PCI patients go through a considerable period of adaptation to their disease over time. This process of adaptation has implications for the development of interventions for PCI patients, which need to support a positive adaptation to living with CHD.

This research identified a number of variables associated with health behaviour change in this population. Interestingly, threat appraisal variables were not positively associated with
either diet or exercise behaviour change. In addition, levels of threat in the PCI patients appeared to be equivalent to those of other patients with CHD. Low levels of threat in PCI patients had previously been postulated as one of the major reasons why PCI patients did not change their behaviour (Ben-Ari, et al., 1989; Gaw-Ens & Laing, 1994; Gaw, 1992; Gentz, 2000; Kimble, 1998; Kimble & King, 1998). The current study did not support this assertion and urges clinicians to rethink their interventions around threat with PCI patients. Indeed, this study found that heightened threat was associated with poorer dietary outcomes. The potentially modifiable variables which were associated with behaviour change in this population include exercise self efficacy, dietary vulnerability and distress regarding a future cardiac event. Interventions which address these key variables may be helpful in the management of patients with PCI. Further work is required to develop an intervention which takes these factors into account.

This study identified PMT plus as a promising theoretical framework to understand behaviour change in PCI patients. The addition of an emotional appraisal measure to the PMT model may assist clinicians and researchers to consider the importance of emotional appraisals alongside cognitive appraisals in the development of interventions which are targeted at patients in general and PCI patients specifically. It is hoped that such interventions would increase the adoption of behaviour change and consequently thus improve patients’ health outcomes.
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APPENDICES
Appendix I Ethics Approval

Mental Health Research and Ethics Committee Ethics approval and
St Vincent’s Health Human Research Ethics Committee ethics approval
Appendix II Study explanation for participants
Study explanation for participants Royal Melbourne Hospital/Melbourne Private Hospital and St Vincent’s Hospital
SUMMARY OF “A STUDY OF FACTORS RELATED TO SPONTANEOUS CHANGES IN FAT INTAKE AND PHYSICAL ACTIVITY AFTER CORONARY ANGIOPLASTY” FOR THE BEHAVIOURAL AND PSYCHIATRIC ETHICS COMMITTEE

Coronary heart disease is one of the major causes of death in Australia. It is caused by occlusion of the coronary arteries by a build up of cholesterol deposits. These deposits are influenced by lifestyle factors, including high levels of saturated fat in the diet, and low levels of exercise. Percutaneous transluminal coronary angioplasty (PTCA) is a treatment designed to expand these arteries by inserting a catheter into the artery concerned, and expanding the catheter.

PTCA is effective in reducing the immediate risk of acute heart disease, but does not prevent future progression of the disease. Effective lifestyle modifications, such as reducing saturated fat intake and increasing physical activity can prevent the progress of heart disease, and, therefore, are of great importance. If the person does not improve these aspects of their lifestyle, it is more likely that they will experience future heart problems.

To develop effective programmes, we want to understand why some people reduce fat intake and exercise, and some do not. We believe that those who are able to change will be those who are most concerned about the prospect of future heart disease, those who believe that they have the ability to change behaviour, and those who feel most pressure to change from friends and family. Another reason that PTCA patients are less likely to change their lifestyles could be that their disease symptoms were less severe. We wish to survey PTCA patients to determine if these factors predict later changes of behaviour. We will also survey participants to determine their preferences for intervention programme formats (e.g. a large face-to-face group, self-help manual or a computer programme).

This research involves two telephone interviews. The first is three to seven days after PTCA, the second after six months. Each interview will take about 45 minutes. This research is intended to strengthen our knowledge of factors that enhance (and inhibit) lifestyle changes in PTCA patients, thus enabling us to develop interventions that will suit this patient group.

Patients who fit study criteria of no history of heart disease (defined as not having had a previous PTCA, coronary bypass surgery, or a myocardial infarction (heart attack) more than three months prior to their PTCA), will be identified from medical records and approached after permission is gained from their treating physician. There is no reason why potential participants cannot make reasoned decisions regarding their participation. The major ethical considerations involve balancing the potential positive outcomes of the study against the possibility that respondents will be adversely affected by the questioning. The latter possibility is compounded by difficulties in arranging debriefing or support during a telephone interview. There are, however, no questions that seek intimate information. Questions that could potentially be upsetting refer to future possibilities of, and feelings about, heart disease. The questionnaire will be administered 3-7 days after PTCA when emotional vulnerability of participants is reduced, and to give them time to spontaneously consider issues of future susceptibility to heart disease. Should a person become upset during an interview, questioning will cease. Patients will be advised to discuss the issue with their physician, or in cases of extreme agitation, be referred to lifeline. The issue of future heart disease is one that participants face independently of the interview, and is likely to have already been raised by their physician.
PLAIN ENGLISH EXPLANATORY STATEMENT FOR PATIENTS - “A STUDY OF FACTORS RELATED TO SPONTANEOUS CHANGES IN FAT INTAKE AND PHYSICAL ACTIVITY AFTER CORONARY ANGIOPLASTY”

The Heart Research Centre would like to invite you to participate in our study of people who have recently undergone a coronary angioplasty.

We are interested in determining the reasons why some people change to a more healthy lifestyle after undergoing a coronary angioplasty, and others are less likely to do so. The more we know about this, the better we will be able to assist people to change to healthier lifestyles.

This research involves two telephone interviews. The first will be some time this week when you are at home, the second will occur in six months time, and also be at home. You can arrange for us to call when it is convenient to you. Each interview will take about 45 minutes. We want to ask you questions about your feelings about your heart problems, whether you believe that future heart problems are likely and how severe they might be, whether you feel confident that you can change your diet exercise patterns, the attitudes of your friends and family toward your diet and exercise patterns and questions about your diet and exercise habits. None of these questions are invasive, embarrassing, or will affect your privacy. However, there is a small risk that the questions about your recent heart problems and the possibility of future heart problems may cause some distress.

We will store interview records in a way that you cannot be identified, and when the results of the research are published, you will not be able to be identified. Only the interviewer and the chief investigator of the study will have access to your interview records.

Your participation in this study is voluntary.

It is important that you understand that your participation in this project must be voluntary. This is the case with all research projects at the Hospital.

If you do not wish to take part, you are under no obligation to do so.

Also, if you decide to take part but you change your mind, you are free to withdraw at any stage.

Your decision whether to take part or not to take part, or to withdraw, will not affect your routine medical treatment or your relationship with those treating you or your relationship with the Hospital.

You should ask for any information you want

If you would like more information about the study or if there is any matter about it that concerns you, either now or in the future, do not hesitate to ask one of the researchers or one of the doctors treating you. People you can ask include Ms Rosemary Higgins on 9347 5544. Before deciding whether or not to take part you may wish to discuss the matter with a relative or friend or with your local doctor. You should feel free to do this.
INFORMATION AND CONSENT FORM

ST. VINCENT'S HOSPITAL

CONSENT TO PARTICIPATE IN RESEARCH STUDY

PROTOCOL NO. (SVH): 81 / 00

NAME OF PARTICIPANT: ____________________________________________

U.R. NO: __________________________________________________________

NAME/S OF INVESTIGATOR/S: Dr. Stephen Brown, Dr. Marian Worcester, Dr. Michael Jelinek, Dr. Alan Goble, Ms. Rosemary Higgins

STUDY PROJECT TITLE: A STUDY OF FACTORS RELATED TO SPONTANEOUS CHANGES IN FAT INTAKE AND PHYSICAL ACTIVITY AFTER CORONARY ANGIOPLASTY

EXPLANATION TO PARTICIPANT:

The Heart Research Centre would like to invite you to participate in our study of people who have recently undergone a coronary angioplasty.

We are interested in determining the reasons why some people change to a healthier lifestyle after undergoing a coronary angioplasty, and others are less likely to do so. The more we know about this, the better we will be able to assist people to change to healthier lifestyles.

This research involves two telephone interviews. The first will be sometime this week when you are at home, the second will occur in six months time, and also be at home. You can arrange for us to call when it is convenient to you. Each interview will take about 45 minutes. We want to ask you questions about your feelings about your heart problems, whether you believe that future heart problems are likely and how severe they might be, whether you feel confident that you can change your diet exercise patterns, the attitudes of your friends and family toward your diet and exercise patterns and questions about your diet and exercise habits. None of these questions are invasive, embarrassing, or will affect your privacy. However, there is a small risk that the questions about your recent heart problems and the possibility of future heart problems may cause some distress.

We will store interview records in a way that you cannot be identified, and when the results of the research are published, you will not be able to be identified. Only the interviewers, Ms. Higgins, Ms Parkinson and the chief investigator of the study will have access to your interview records.
Your participation in this study is voluntary.

It is important that you understand that your participation in this project must be voluntary. This is the case with all research projects at the Hospital.

If you do not wish to take part, you are under no obligation to do so.

Also, if you decide to take part but you change your mind, you are free to withdraw at any stage.

Your decision whether to take part or not to take part, or to withdraw, will not affect your routine medical treatment or your relationship with those treating you or your relationship with the Hospital.

You should ask for any information you want

If you would like more information about the study or if there is any matter about it that concerns you, either now or in the future, do not hesitate to ask one of the researchers or one of the doctors treating you. People you can ask include (set out name and telephone number of a researcher, and name and telephone number of a treating doctor). Before deciding whether or not to take part you may wish to discuss the matter with a relative or friend, or with your local doctor. You should feel free to do this.

Information and Problems

If you require further information or have any problems concerning the project in which you are involved, you should contact the principal investigator. The principal investigator responsible for this project is Dr Marian Worcester of the Heart Research Centre, Box 2137, Royal Melbourne Hospital 3050, telephone 9347 5544.

Complaints

If you have any complaints about any aspect of the study or the way in which it is being conducted you may contact the Patient Representative at St Vincent's Hospital on Telephone: 9288 2211. You will need to tell the Patient Representative the name of the person who is noted above as principal investigator.
Appendix III Informed consent forms
Informed consent form for participants at Royal Melbourne/Melbourne Private Hospital and St Vincent’s Hospital
CONSENT/REQUEST TO PARTICIPATE IN A RESEARCH PROJECT

TITLE OF RESEARCH PROJECT: A Study of Factors Related to Spontaneous Changes in Fat Intake and Physical Activity After Coronary Angioplasty.

RESEARCHERS: Ms. Rosemary Higgins / Ms Anne Parkinson

I, Rosemary Higgins/Anne Parkinson CERTIFY THAT I have fully explained the aims, risks, and procedures of the research to the PATIENT named herein and have handed to the PATIENT a copy of this Consent together with a PLAIN ENGLISH STATEMENT of aims and procedures of the experiment and any risks to the PATIENT.

In my opinion the PATIENT appears to understand and wishes to participate.

I undertake to the PATIENT that the confidentiality and anonymity of the PATIENT and his or her records will be preserved at all times.

SIGNED: .................................................................

DATE: ..............................................................

CONSENT OF PATIENT

The purpose of the above project has been fully explained to me and I have read and signed the attached PLAIN ENGLISH EXPLANATORY STATEMENT. I UNDERSTAND the aims and procedures of the experiment and any risks to myself which are involved and I REQUEST to participate on condition that I can withdraw my Consent at any time.

SIGNED: .................................................................

DATE: ..............................................................
PARTICIPANT DECLARATION (St Vincent’s Hospital)

PART ONE
I certify that I have provided the participant/the guardian of the participant/the next friend of the participant, with adequate information on the above research procedure which, according to my assessment of the person’s level of comprehension, he/she seemed fully to understand. I declare that the below-named person freely gave consent to take part in this research study and investigation.

Investigator's signature: ..............................................................................................................
(Including title)

PART TWO
Where applicable: I certify that I have translated the above explanation and declaration and assisted Ms. Higgins / Ms Parkinson with the oral translation to the person below in the ........................................ language which the person has indicated he/she understands.

Interpreter: .................................................................................................................................

PART THREE
Ms. Higgins/ Ms Parkinson has explained the purpose and nature of the research, the research methods and procedures and risks and discomfort associated with them. I am willing to take part in this research and I consent to all of the procedures, and to the risks associated with them that have been explained to me. I understand that I am free to withdraw from this study at any time without jeopardising the management of my condition, and the future care and attention which I will receive.

Dated the ........................................... day of .................................................. 20……

Signed: .................................................................................................................................
(Participant/Guardian/Next Friend)

Witness: .................................................................................................................................
Appendix IV Interview schedule at Time 1
QUESTIONNAIRE TO BE ADMINISTERED TO PTCA PATIENTS - BASELINE

This questionnaire is to be administered with questions phrased exactly as printed. Questions may be rephrased only if not originally understood. Repeat the question when necessary. Do not read out the response set. The respondent will often respond in a way that is incompatible with the response format. In this case, choose the two or three responses that most closely represent the response you do get, and ask the respondent to choose between them. Never present the respondent with a single response to endorse. Respondents will reply at length to some questions. This is OK, but attempt to get them back on track. Questions are thematically organised to make this easier.

There is a slim chance that questioning may upset respondents. If this occurs, discontinue questioning and suggest that they discuss the matter with their physician. If distress is extreme, refer them to their general practitioner.

Good Morning/Afternoon/Evening
I am .......... from the Heart Research Centre. Several days ago, we spoke after you had undergone your angioplasty and you agreed to take part in our telephone survey. The interview will last about 45 minutes. I am wondering if you are still interested in participating, and, if so, whether it is convenient to conduct the interview now. I would be happy to call back at a time convenient to you.

Procedure date     ___/____/____
Interval (days) since procedure   ____________days
OR
Reason for withdrawal  _______________________________________________

Group
  1 = AMI
  2 = Severe unstable angina
  3 = Non severe angina or asymptomatic

Age     ______ years
Gender     1 = Male
             2 = Female

Occupation  _______________________________________

Highest education level attained (include trade)

Age left school or university  ______ years

Telephone number _______________________________________

Vessel Number (from the medical record, not asked of the patient)
  1 = Single vessel    PTCA
  2 = Multiple vessel PTCA
How are you today?

I am going to ask you some questions regarding the foods you eat during an ordinary week.

1. How often per week would you eat gravy, cream sauces or cheese sauces?
   - 4 Six or more
   - 3 Three to five
   - 2 Once or twice
   - 1 Less than once
   - 0 Never

2. How often per week do you eat sausages, devon, salamis, meat pies, hamburgers or bacon?
   - 4 Six or more
   - 3 Three to five
   - 2 Once or twice
   - 1 Less than once
   - 0 Never

3. How often per week do you eat chips or French fries?
   - 4 Six or more
   - 3 Three to five
   - 2 Once or twice
   - 1 Less than once
   - 0 Never

4. How often per week do you eat pastries, cakes, sweet biscuits or croissants?
   - 4 Six or more
   - 3 Three to five
   - 2 Once or twice
   - 1 Less than once
   - 0 Never

5. How often per week do you eat potato crisps or corn chips?
   - 4 Six or more
   - 3 Three to five
   - 2 Once or twice
   - 1 Less than once
   - 0 Never

6. How often per week do you eat ice cream?
   - 4 Six or more
   - 3 Three to five
   - 2 Once or twice
   - 1 Less than once
   - 0 Never
7. How often per week do you eat cheddar, edam or other hard cheese, cream cheese or soft cheese such as camembert?
   4 Six or more
   3 Three to five
   2 Once or twice
   1 Less than once
   0 Never

8. What type of milk do you drink or use in cooking or tea and coffee?
   4 Condensed
   3 Full cream
   2 Full cream & reduced fat
   1 Reduced fat
   0 Skim or none

Think about the foods we discussed in the previous questions. A low fat diet means that you should only eat them two or three times per week. Do you think that you might have a/another heart attack if you eat a high fat diet?

9. If you ate a high fat diet, what is the chance that you will have a/another heart attack?
   100%   75%   50%   25%   No chance

10. How much do you think that sticking to a low fat diet would reduce the chances of you having a/another heart attack?
     Eliminate them   75%   50%   25%   No effect

11. Do you currently have a low fat diet?
    YES    NO (go to q. 13a)

12. (If so) How long have you been eating a low fat diet? ________________ (go to q 19)

13a Could you please indicate if the following statements apply to you. (ask only if person doesn’t have a low fat diet)

13. I am seriously thinking about taking up a low fat diet over the next six months
    YES    NO

14. I am seriously thinking about taking up a low fat diet over the next month
    YES    NO

15. I intend to start a low fat diet during the next six months
    YES    NO

16. I intend to start a low fat diet during the next month
    YES    NO

17. I have decided exactly when I will start a low fat diet
    YES    NO
18. I have planned some strategies (eg modify shopping habits, try to get family to avoid fatty foods etc.) to help me stick to a low fat diet
   YES ☐ NO ☐

19. If you wanted to, how confident are you that you could establish/maintain a permanent low fat diet within the next six months?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

20. How confident are you that you understand enough about food types to stick to a low fat diet?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

21. How confident are you that the person who does most of the cooking can cook low fat meals?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

22. How confident are you that you can stick to a low fat diet when people bring high-fat foods into your home?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

23. What is your partner’s attitude toward you starting a low fat diet?
   5 Very positive
   4 Positive
   3 Neutral / No attitude
   2 Negative
   1 Very negative
24. What is your family’s attitude toward you starting a low fat diet?

5  Very positive
4  Positive
3  Neutral / No attitude
2  Negative
1  Very negative

25. Overall, what attitudes do your close friends have toward you starting a low fat diet?

5  Very positive
4  Positive
3  Neutral / No attitude
2  Negative
1  Very negative

26. Do you intend to adopt a permanent low fat diet within the next six months? (Circle one)

YES  NO (go to 29)  ALREADY ON (go to 28)

27. (if so) Have you decided when you will do so? (Circle one)

YES  NO

28. Have you planned any strategies to help you (e.g., modify shopping habits, get family to avoid fatty foods)? (If yes give details)

________________________________________________________________________
________________________________________________________________________

29. When you had your heart problems, how painful were the worst of your chest pains?

6  More pain than I ever felt
5  Extremely painful
4  Moderately painful
3  Minor pain
2  No pain
1  No symptoms (skip to q 34)

30. How frightened were you by the worst of your chest pains?

5  More frightened than I ever felt
4  Extremely frightened
3  Moderately frightened
2  A little frightened
1  Not frightened
31. How upset did the **worst** of your chest pains make you feel?
   5 More upset than I ever felt
   4 Extremely upset
   3 Moderately upset
   2 A little upset
   1 Not upset

32. How anxious did the **worst** of your chest pains make you feel?
   5 More anxious than I ever felt
   4 Extremely anxious
   3 Moderately anxious
   2 A little anxious
   1 Not anxious

33. How depressed did the **worst** of your chest pains make you feel?
   5 More depressed than I ever felt
   4 Extremely depressed
   3 Moderately depressed
   2 A little depressed
   1 Not depressed

34. How frightened were you **when you were told** you had a heart attack/needed a PTCA?
   5 More frightened than I ever felt
   4 Extremely frightened
   3 Moderately frightened
   2 A little frightened
   1 Not frightened

35. How upset were you **when you were told**?
   5 More upset than I ever felt
   4 Extremely upset
   3 Moderately upset
   2 A little upset
   1 Not upset
36. How anxious were you **when you were told**?

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>More anxious than I ever felt</td>
</tr>
<tr>
<td>4</td>
<td>Extremely anxious</td>
</tr>
<tr>
<td>3</td>
<td>Moderately anxious</td>
</tr>
<tr>
<td>2</td>
<td>A little anxious</td>
</tr>
<tr>
<td>1</td>
<td>Not anxious</td>
</tr>
</tbody>
</table>

37. How depressed were you **when you were told**?

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>More depressed than I ever felt</td>
</tr>
<tr>
<td>4</td>
<td>Extremely depressed</td>
</tr>
<tr>
<td>3</td>
<td>Moderately depressed</td>
</tr>
<tr>
<td>2</td>
<td>A little depressed</td>
</tr>
<tr>
<td>1</td>
<td>Not depressed</td>
</tr>
</tbody>
</table>

38. How serious would it be if you had a/another heart attack?

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>The most serious event imaginable</td>
</tr>
<tr>
<td>5</td>
<td>Extremely serious</td>
</tr>
<tr>
<td>4</td>
<td>Very serious</td>
</tr>
<tr>
<td>3</td>
<td>Moderately serious</td>
</tr>
<tr>
<td>2</td>
<td>A little serious</td>
</tr>
<tr>
<td>1</td>
<td>Not serious at all</td>
</tr>
</tbody>
</table>

39. How easy was it for doctors treat your heart problems?

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Extremely easy</td>
</tr>
<tr>
<td>4</td>
<td>Very easy</td>
</tr>
<tr>
<td>3</td>
<td>Moderately easy</td>
</tr>
<tr>
<td>2</td>
<td>Difficult</td>
</tr>
<tr>
<td>1</td>
<td>Extremely difficult</td>
</tr>
</tbody>
</table>

40. If you have a/another heart attack, how easily would doctors be able to deal with it?

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Extremely easy</td>
</tr>
<tr>
<td>4</td>
<td>Very easy</td>
</tr>
<tr>
<td>3</td>
<td>Moderately easy</td>
</tr>
<tr>
<td>2</td>
<td>Difficult</td>
</tr>
<tr>
<td>1</td>
<td>Extremely difficult</td>
</tr>
</tbody>
</table>
We want to understand how seriously you view the prospect of having a heart attack compared with other diseases. I will read you a list of five diseases and I want you to compare them with a heart attack. Could you please tell me how serious a heart attack is compared with the following diseases.

<table>
<thead>
<tr>
<th></th>
<th>More serious than MI</th>
<th>Equally serious</th>
<th>Less serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.</td>
<td>Lung cancer</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>42.</td>
<td>HIV/AIDS</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>43.</td>
<td>Stroke</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>44.</td>
<td>Pneumonia</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>45.</td>
<td>Brain tumour</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>46.</td>
<td>Breast/testicular cancer</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

47. Assuming that you don’t change your current lifestyle, how likely is it that you will have a/another heart attack in the future? (circle one)

- 100%  
- 75%  
- 50%  
- 25%  
- No chance

48. Assuming that you don’t change your current lifestyle, how likely is it that you will have any other kind of heart trouble in the future (eg, angina, bypass surgery, repeat PTCA)?

- 100%  
- 75%  
- 50%  
- 25%  
- No chance

Have you ever thought about the possibility of a/another heart attack?

49. How frightened do you feel when you think about the possibility of a/another heart attack?

- 5 More frightened than I ever felt  
- 4 Extremely frightened  
- 3 Moderately frightened  
- 2 A little frightened  
- 1 Not frightened  
- 0 Have not considered

50. How upset do you feel when you think about the possibility of a/another heart attack?

- 5 More upset than I ever felt  
- 4 Extremely upset  
- 3 Moderately upset  
- 2 A little upset  
- 1 Not upset  
- 0 Have not considered
51. How anxious do you feel when you think about the possibility of a/another heart attack?
   5  More anxious than I ever felt
   4  Extremely anxious
   3  Moderately anxious
   2  A little anxious
   1  Not anxious
   0  Have not considered

52. How depressed do you feel when you think about the possibility of a/another heart attack?
   5  More depressed than I ever felt
   4  Extremely depressed
   3  Moderately depressed
   2  A little depressed
   1  Not depressed
   0  Have not considered

What sort of exercise did you normally do before you had your heart attack/PTCA?
*Record type of physical activity (ask them if chest pains/angina curtailed their exercise compared with usual patterns. If so, the following questions refer to what they did before this restriction.)*

53. Before you had your heart attack/PTCA, how many times would you have walked for 20 minutes or longer during an average week? When you answer, please think about things such as walking to work, to the shops or to a bus stop.

   ____ times

54. How many times would you have walked for 10 minutes or longer?

   ____ times

55. Apart from work or housework, how many times per week would you have done 20 minutes of exercise that is hard enough to make you breathe a little harder than normal, or start to sweat? This can include any activity such as gardening, walking or playing sport.

   ____ times

56. How many times per week would you have done 20 minutes of work/housework that is hard enough to make you breathe a little harder than normal, or start to sweat?
A regular exercise program involves any planned physical activity done to improve your fitness. Exercise should be done for at least 20 minutes on at least four days per week.

57. If you do not adhere to a regular exercise program, what is the chance that you will have another heart attack?

100% 75% 50% 25% No chance

58. How much do you think that a regular exercise program would reduce the chances of you having another heart attack?

Eliminate them 75% 50% 25% No effect

59. Do you currently engage in regular exercise?

YES NO (go to q 61)

60. (If YES) How long have you been regularly exercising? ____________ (months)

(go to q 67)

(If NO) Could you please indicate if the following statements apply to you.

61. I am seriously thinking about taking up regular exercise over the next six months

YES NO

62. I am seriously thinking about taking up regular exercise over the next month

YES NO

63. I intend to start exercising regularly during the next six months

YES NO

64. I intend to start exercising regularly during the next month

YES NO

65. I have decided exactly when I will start a regular exercise programme

YES NO

66. I have planned some strategies to help me exercise regularly?

(eg organise a walking partner, buy equipment or clothing etc.)

YES NO

67. If you wanted to, how confident are you that you can establish/maintain regular exercise
over the next six months?
5  Absolutely confident
4  Very confident
3  Moderately confident
2  Not very confident
1  Not confident at all

68. How confident are you that you can exercise regularly, even if you feel a little down or depressed?
5  Absolutely confident
4  Very confident
3  Moderately confident
2  Not very confident
1  Not confident at all

69. How confident are you that you can exercise regularly, even if you can’t notice your fitness improving?
5  Absolutely confident
4  Very confident
3  Moderately confident
2  Not very confident
1  Not confident at all

70. How confident are you that you can exercise regularly, even if you get bored with the activity?
5  Absolutely confident
4  Very confident
3  Moderately confident
2  Not very confident
1  Not confident at all

71. How confident are you that you can exercise regularly, even if you have to do it by yourself?
5  Absolutely confident
4  Very confident
3  Moderately confident
2  Not very confident
1  Not confident at all

Do you live with anybody else?
YES       NO  (skip to q 74)

If they live with a partner, use the term (e.g., partner, wife, husband) which they use.

72. What is your (partner’s) attitude toward you having a regular exercise program?
5  Very positive
4  Positive

166
3. Neutral / No attitude
2. Negative
1. Very negative

73. When you make an important personal decision, how important to you is your (partner’s) attitude?
5. Very important
4. Moderately important
3. Important
2. Not very important
1. Not important at all

74. What is your family’s attitude toward you having a regular exercise program?
5. Very positive
4. Positive
3. Neutral / No attitude
2. Negative
1. Very negative

75. When you make an important personal decision, how important to you is your family’s attitude?
5. Very important
4. Moderately important
3. Important
2. Not very important
1. Not important at all

76. Overall, what attitudes do your close friends have toward you having a regular exercise program?
5. Very positive
4. Positive
3. Neutral / No attitude
2. Negative
1. Very negative

77. When you make an important personal decision, how important to you are your close friends’ attitudes?
5. Very important
4. Moderately important
3. Important
2. Not very important
1. Not important at all

We are nearly finished. Now we just want to ask you a few questions about what sort of assistance you may like in the future.
Appendix V Interview schedule at Time 2
QUESTIONNAIRE TO BE ADMINISTERED TO PTCA PATIENTS – 6 MONTH
This questionnaire is to be administered with questions phrased exactly as printed. Questions may be rephrased only if not originally understood. Repeat the question when necessary. Do not read out the response set. The respondent will often respond in a way that is incompatible with the response format. In this case, choose the two or three responses that most closely represent the response you do get, and ask the respondent to choose between them. Never present the respondent with a single response to endorse. Respondents will reply at length to some questions. This is OK, but attempt to get them back on track. Questions are thematically organised to make this easier.

There is a slim chance that questioning may upset respondents. If this occurs, discontinue questioning and suggest that they discuss the matter with their physician. If distress is extreme, refer them to their general practitioner.

Good Morning/Afternoon/Evening
I am Rosemary Higgins from the Heart Research Centre. Six months ago, you took part in our telephone survey on your experience with your coronary angioplasty. I am wondering if you are interested in participating in a follow-up survey. This interview should take about 40 minutes. If you are happy to continue to participate we could conduct the interview now. Otherwise, I would be happy to call back at a time convenient to you.

Procedure date     ____/____/____
Interval (days) since procedure   ____________days

OR
Reason for withdrawal

Group
1 = AMI
2 = Severe unstable angina
3 = Non severe angina or asymptomatic

Age     ______ years
Gender     1 = Male
2 = Female

Occupation

Highest education level attained (include trade)

Telephone number

How are you today? We want to ask you some questions about how seriously you view heart disease
1. How serious would it be if you had another heart attack?
   6 The most serious event imaginable
   5 Extremely serious
   4 Very serious
   3 Moderately serious
   2 A little serious
   1 Not serious at all

2. How easy was it for doctors to treat your heart problems?
   5 Extremely easy
   4 Very easy
   3 Moderately easy
   2 Difficult
   1 Extremely difficult

3. If you have another heart attack, how easily would doctors be able to deal with it?
   5 Extremely easy
   4 Very easy
   3 Moderately easy
   2 Difficult
   1 Extremely difficult

We want to understand how seriously you view the prospect of having a heart attack compared with other diseases. I will read you a list of five diseases and I want you to compare them with a heart attack. Could you please tell me how serious a heart attack is compared with the following diseases.

<table>
<thead>
<tr>
<th>Disease</th>
<th>More serious than MI</th>
<th>Equally serious</th>
<th>Less serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Lung cancer</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5. HIV/AIDS</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6. Stroke</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7. Pneumonia</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8. Brain tumour</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9. Breast/testicular cancer</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
10. Assuming that you don’t change your current lifestyle, how likely is it that you will have another heart attack in the future? (circle one)

100%  75%  50%  25%  No chance

11. Assuming that you don’t change your current lifestyle, how likely is it that you will have any kind of heart trouble in the future (eg, angina, bypass surgery, repeat PTCA)?

100%  75%  50%  25%  No chance

Have you ever thought about the possibility of another heart attack?

12. How frightened do you feel when you think about the possibility of another heart attack?

5  More frightened than I ever felt
4  Extremely frightened
3  Moderately frightened
2  A little frightened
1  Not frightened
0  Have not considered

13. How upset do you feel when you think about the possibility of another heart attack?

5  More upset than I ever felt
4  Extremely upset
3  Moderately upset
2  A little upset
1  Not upset
0  Have not considered

14. How anxious do you feel when you think about the possibility of another heart attack?

5  More anxious than I ever felt
4  Extremely anxious
3  Moderately anxious
2  A little anxious
1  Not anxious
0  Have not considered

15. How depressed do you feel when you think about the possibility of another heart attack?

5  More depressed than I ever felt
4  Extremely depressed

3 Moderately depressed
2 A little depressed
1 Not depressed
0 Have not considered

What sort of exercise do you normally do

*Record type of physical activity*

16. How many times would you walk for 20 minutes or longer during an average week? When you answer, please think about things such as walking to work, to the shops or to a bus stop.
   ___ times

17. How many times would you walk for 10 minutes or longer?
   ___ times

18. Apart from work or housework, how many times per week would you do 20 minutes of exercise that is hard enough to make you breathe a little harder than normal, or start to sweat? This can include any activity such as gardening, walking or playing sport.
   ___ times

19. How many times per week would you do 20 minutes of work/housework that is hard enough to make you breathe a little harder than normal, or start to sweat?
   ___ times

A regular exercise program involves any planned physical activity done to improve your fitness. Exercise should be done for at least 20 minutes on at least four days per week.

20. If you do not adhere to a regular exercise program, what is the chance that you will have a/another heart attack?
   100%  75%  50%  25%  No chance
21. How much do you think that a regular exercise program would reduce the chances of you having a/another heart attack?

Eliminate them  75%  50%  25%  No effect

22. Do you currently engage in regular exercise?
YES  NO (go to q 61)

23. (If YES) How long have you been regularly exercising? ___________ (months) (go to q 67)

(If NO) Could you please indicate if the following statements apply to you.

24. I am **seriously thinking** about taking up regular exercise over the next **six months**
YES  NO

25. I am **seriously thinking** about taking up regular exercise over the **next month**
YES  NO

26. I **intend** to start exercising regularly during the next **six months**
YES  NO

27. I **intend** to start exercising regularly during the **next month**
YES  NO

28. I **have decided** exactly when I **will start** a regular exercise programme
YES  NO

29. I have planned some strategies to help me exercise regularly?
(eg organise a walking partner, buy equipment or clothing etc.)
YES  NO

30. If you wanted to, how confident are you that you can establish/maintain regular exercise over the next six months?

5 Absolutely confident
4 Very confident
3 Moderately confident
2 Not very confident
1 Not confident at all
31. How confident are you that you can exercise regularly, even if you feel a little down or depressed?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

32. How confident are you that you can exercise regularly, even if you can’t notice your fitness improving?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

33. How confident are you that you can exercise regularly, even if you get bored with the activity?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

34. How confident are you that you can exercise regularly, even if you have to do it by yourself?
   5 Absolutely confident
   4 Very confident
   3 Moderately confident
   2 Not very confident
   1 Not confident at all

Do you live with anybody else?

YES     NO (skip to q 74)

If they live with a partner, use the term (e.g., partner, wife, husband) which they use.
35. What is your (partner’s) attitude toward you having a regular exercise program?
   5  Very positive
   4  Positive
   3  Neutral / No attitude
   2  Negative
   1  Very negative

36. When you make an important personal decision, how important to you is your (partner’s) attitude?
   5  Very important
   4  Moderately important
   3  Important
   2  Not very important
   1  Not important at all

37. What is your family’s attitude toward you having a regular exercise program?
   5  Very positive
   4  Positive
   3  Neutral / No attitude
   2  Negative
   1  Very negative

38. When you make an important personal decision, how important to you is your family’s attitude?
   5  Very important
   4  Moderately important
   3  Important
   2  Not very important
   1  Not important at all

39. Overall, what attitudes do your close friends have toward you having a regular exercise program?
   5  Very positive
   4  Positive
   3  Neutral / No attitude
   2  Negative
   1  Very negative

40. When you make an important personal decision, how important to you are your close friends’ attitudes?
   5  Very important
   4  Moderately important
   3  Important
   2  Not very important
   1  Not important at all
I am going to ask you some questions regarding the foods you eat during an ordinary week.

41. How often per week would you eat gravy, cream sauces or cheese sauces?
   4  Six or more
   3  Three to five
   2  Once or twice
   1  Less than once
   0  Never

42. How often per week do you eat sausages, devon, salamis, meat pies, hamburgers or bacon?
   4  Six or more
   3  Three to five
   2  Once or twice
   1  Less than once
   0  Never

43. How often per week do you eat chips or French fries?
   4  Six or more
   3  Three to five
   2  Once or twice
   1  Less than once
   0  Never

44. How often per week do you eat pastries, cakes, sweet biscuits or croissants?
   4  Six or more
   3  Three to five
   2  Once or twice
   1  Less than once
   0  Never

45. How often per week do you eat potato crisps or corn chips?
   4  Six or more
   3  Three to five
   2  Once or twice
   1  Less than once
   0  Never

46. How often per week do you eat ice cream?
   4  Six or more
   3  Three to five
   2  Once or twice
   1  Less than once
   0  Never
47. How often per week do you eat cheddar, edam or other hard cheese, cream cheese or soft cheese such as camembert?
   4 Six or more
   3 Three to five
   2 Once or twice
   1 Less than once
   0 Never

48. What type of milk do you drink or use in cooking or tea and coffee?
   4 Condensed
   3 Full cream
   2 Full cream & reduced fat
   1 Reduced fat
   0 Skim or none

Think about the foods we discussed in the previous questions. A low fat diet means that you should only eat them two or three times per week. Do you think that you might have a/another heart attack if you eat a high fat diet?

49. If you ate a high fat diet, what is the chance that you will have a/another heart attack?
   100%  75%  50%  25%  No chance

50. How much do you think that sticking to a low fat diet would reduce the chances of you having a/another heart attack?
   Eliminate them  75%  50%  25%  No effect

51. Do you currently have a low fat diet?
   YES    NO (go to q. 13a)

52. (If so) How long have you been eating a low fat diet? ________________ (go to q 19)

53a Could you please indicate if the following statements apply to you.
   (ask only if person doesn’t have a low fat diet)

53. I am seriously thinking about taking up a low fat diet over the next six months
   YES   NO

54. I am seriously thinking about taking up a low fat diet over the next month
   YES   NO

55. I intend to start a low fat diet during the next six months
   YES   NO

56. I intend to start a low fat diet during the next month
   YES   NO
57. **I have decided** exactly when **I will start** a low fat diet
   YES          NO

58. I have planned some strategies (e.g., modify shopping habits, try to get family to avoid fatty foods etc.) to help me stick to a low fat diet
   YES          NO

59. If you wanted to, how confident are you that you could establish/maintain a permanent low fat diet within the next six months?
   5  Absolutely confident
   4  Very confident
   3  Moderately confident
   2  Not very confident
   1  Not confident at all

60. How confident are you that you understand enough about food types to stick to a low fat diet?
   5  Absolutely confident
   4  Very confident
   3  Moderately confident
   2  Not very confident
   1  Not confident at all

61. How confident are you that the person who does most of the cooking can cook low fat meals?
   5  Absolutely confident
   4  Very confident
   3  Moderately confident
   2  Not very confident
   1  Not confident at all

62. How confident are you that you can stick to a low fat diet when people bring high-fat foods into your home?
   5  Absolutely confident
   4  Very confident
   3  Moderately confident
   2  Not very confident
   1  Not confident at all

63. What is your partner’s attitude toward you starting a low fat diet?
   5  Very positive
   4  Positive
   3  Neutral / No attitude
   2  Negative
   1  Very negative
64. What is your family’s attitude toward you starting a low fat diet?
   5 Very positive □
   4 Positive □
   3 Neutral / No attitude □
   2 Negative □
   1 Very negative □

65. Overall, what attitudes do your close friends have toward you starting a low fat diet?
   5 Very positive □
   4 Positive □
   3 Neutral / No attitude □
   2 Negative □
   1 Very negative □

66. Do you intend to adopt a permanent low fat diet within the next six months? (Circle one)
   YES □ NO (go to 29) ALREADY ON (go to 28) □

67. (if so) Have you decided when you will do so? (Circle one)
   YES □ NO □

68. Have you planned any strategies to help you (e.g., modify shopping habits, get family to avoid fatty foods)? (If yes give details)

__________________________________________________________________________
__________________________________________________________________________ □

We are interested in calling you in six months to find out how you are doing. Can we have your permission to do this?
   YES □ NO □
### Appendix VI Individual scale items

<table>
<thead>
<tr>
<th><strong>Level of pain experienced</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>How painful were the worst of your chest pains?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Emotional impact of cardiac event</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>How frightened were you by the worst of your chest pains?</td>
<td></td>
</tr>
<tr>
<td>How upset were you by the worst of your chest pains?</td>
<td></td>
</tr>
<tr>
<td>How anxious were you by the worst of your chest pains?</td>
<td></td>
</tr>
<tr>
<td>How depressed were you by the worst of your chest pains?</td>
<td></td>
</tr>
<tr>
<td>How frightened were you when you were told you had a heart attack/ needed a PCI?</td>
<td></td>
</tr>
<tr>
<td>How upset were you when you were told you had a heart attack/ needed a PCI?</td>
<td></td>
</tr>
<tr>
<td>How anxious were you when you were told you had a heart attack/ needed a PCI?</td>
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<tr>
<td>How depressed were you when you were told you had a heart attack/ needed a PCI?</td>
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</table>
### List of PMT scales and individual items utilised in each scale

**Severity**
- How serious would it be if you had a/another heart attack?

**Physical activity vulnerability**
- If you do not adhere to a regular exercise program, what is the chance that you will have a/another heart attack?
- Assuming that you don’t change your current lifestyle how likely is it that you will have a/another heart attack in the future?
- Assuming that you don’t change your current lifestyle how likely is it that you will have any other kind of heart trouble in the future?

**Dietary vulnerability**
- If you ate a high saturated fat diet, what is the chance that you will have a/another heart attack?
- Assuming that you don’t change your current lifestyle how likely is it that you will have a/another heart attack in the future?
- Assuming that you don’t change your current lifestyle how likely is it that you will have any other kind of heart trouble in the future?

**Physical activity response efficacy**
- How much do you think that sticking to a regular exercise program would reduce the chances of you having a/another heart attack?

**Dietary response efficacy**
- How much do you think that sticking to a low fat diet would reduce the chances of you having a/another heart attack?

**Physical activity self efficacy**
- How confident are you that you can exercise regularly, even if you feel a little down or depressed?
- How confident are you that you can exercise regularly, even if you can’t notice your fitness improving?
- How confident are you that you can exercise regularly, even if you have to do it by yourself?
- How confident are you that you can exercise regularly, even if you get bored with the activity?
- How confident are you that you can exercise regularly even if the weather is a little unpleasant?

**Dietary self efficacy**
- How confident are you that you can eat mostly low fat foods when you have guests staying in your home?
- How confident are you that you can stick with low fat foods when someone eats high fat foods right in front of you?
- How confident are you that you can stick to low fat foods when family members or friends have brought high fat foods into your home?
- How confident are you that you can go out of your way to find another shop or eating place to get low fat foods?
**Distress regarding a future event scale items**

Tell me how frightened you feel when you think about the possibility of having further heart problems
Tell me how upset you feel when you think about the possibility of having further heart problems
Tell me how anxious do you feel when you think about the possibility of having further heart problems
Tell me how depressed do you feel when you think about the possibility of having further heart problems?

**Saturated fat intake scale items**

I am going to ask you some questions regarding the foods you eat *during an ordinary week*.

How often per week would you eat gravy, cream sauces or cheese sauces?

- 4: Six or more
- 3: Three to five
- 2: Once or twice
- 1: Less than once
- 0: Never

How often per week do you eat sausages, devon, salamis, meat pies, hamburgers or bacon?

- 4: Six or more
- 3: Three to five
- 2: Once or twice
- 1: Less than once
- 0: Never

How often per week do you eat chips or French fries?

- 4: Six or more
- 3: Three to five
- 2: Once or twice
- 1: Less than once
- 0: Never

How often per week do you eat pastries, cakes, sweet biscuits or croissants?

- 4: Six or more
- 3: Three to five
- 2: Once or twice
- 1: Less than once
- 0: Never
How often per week do you eat potato crisps or corn chips?

4 Six or more
3 Three to five
2 Once or twice
1 Less than once
0 Never

How often per week do you eat ice cream?

4 Six or more
3 Three to five
2 Once or twice
1 Less than once
0 Never

How often per week do you eat cheddar, edam or other hard cheese, cream cheese or soft cheese such as camembert?

4 Six or more
3 Three to five
2 Once or twice
1 Less than once
0 Never

48. What type of milk do you drink or use in cooking or tea and coffee?

4 Condensed
3 Full cream
2 Full cream & reduced fat
1 Reduced fat
0 Skim or none
Appendix VII Histograms for walking and saturated fat intake

Histogram Walking episodes at Time 1

Mean = 3.45
Std. Dev. = 3.32
N = 218
Histogram Walking episodes at Time 2

Mean = 4.26
Std. Dev. = 3.049
N = 198
Histogram T2–T1 Walking episodes
Histogram  Saturated fat intake at Time 1
Histogram Saturated fat intake at Time 2
Histogram T2 – T1 Saturated fat intake

Mean = -0.45
Std. Dev. = 4.357
N = 195
### Appendix VIII ANOVA summary tables

**ANOVA summary table for saturated fat intake and walking episodes**

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<th>F</th>
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