PREDICTORS OF OUTCOME IN CARDIAC DISEASE: THE ROLE OF PERSONALITY AND ILLNESS COGNITIONS

Lynn Williams

Department of Psychology

University of Stirling

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Abstract

Background: Coronary heart disease can have a long lasting impact on affected individuals in terms of both physical and psychological adjustment and quality of life. It is, therefore, important to investigate determinants of outcome in these patients. The thesis has four main aims; (i) to investigate predictors of outcome (adherence, quality of life, functional impairment, psychological distress and benefit finding) post-myocardial infarction (MI); (ii) to determine the prevalence and stability of Type D personality in the UK; (iii) to determine if personality predicts outcome after controlling for mood, demographic and clinical factors, and (iv) to investigate potential mechanisms which may explain the link between personality and poor prognosis in cardiac patients. **Method**: Five studies were conducted. In Studies 1-3, participants completed measures of Type D personality, health-related behaviour, social support and neuroticism. In Study 4, participants completed an experimental stressor with cardiovascular monitoring. Study 5 was a prospective study in which 131 MI patients completed measures of personality, illness cognitions and outcome at two time points, 3-5 days post-MI, then again 3 months later. **Results**: The prevalence of Type D personality in the UK is 39% in the healthy population, and 34% in the cardiac population. In addition, Type D is predictive of adherence, quality of life, and functional impairment in post-MI patients after controlling for mood, demographics, and clinical factors. Five possible mechanisms (health-related behaviour, adherence, social support, cardiovascular reactivity, and illness perceptions) by which Type D may lead to adverse outcome in cardiac patients were identified. Mood predicted quality of life and functional impairment post-MI, illness perceptions predicted quality of life post-MI, and future thinking predicted quality of life, functional impairment and depression post-MI. **Discussion**: These findings have important therapeutic and theoretical implications for understanding the role of personality and illness cognitions in the short-term recovery of post-MI patients.

Publications Arising From This Thesis

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Williams, L., O'Carroll, R.E. & O'Connor, R.C. (in press). Type D Personality and cardiac output in response to stress. *Psychology and Health*.

Acknowledgements

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Index of Abbreviations

ANCOVA: Analysis of Covariance

BF: Benefit Finding

BMQ: Beliefs about Medicines Questionnaire

BP: Blood Pressure

CABG: Coronary Artery Bypass Grafting

CHD: Coronary Heart Disease

CHF: Chronic Heart Failure

CK: Creatine Kinase

CO: Cardiac Output

CSM: Common Sense Model of Self-Regulation

CVD: Cardiovascular Disease

CVR: Cardiovascular Reactivity

DBP: Diastolic Blood Pressure

DS14:   Type D Personality Scale

EPQR-S: Eysenck Personality Questionnaire Revised

FLP: Functional Limitations Profile

FTT: Future Thinking Task

GPHB: General Preventive Health Behaviours Checklist

HADS: Hospital Anxiety and Depression Scale

HBM: Health Belief Model

HR: Heart Rate

ICD: Implantable Cardioveter Defibrillator

IPQ: Illness Perception Questionnaire

LOT-R: Life Orientation Task Revised

LVF: Left Ventricular Functioning

M: Mean

MANOVA: Multivariate Analysis of Variance

MARS: Medication Adherence Response Scale

MI: Myocardial Infarction

MOS-SSS: Medical Outcomes Study Social Support Scale

NA: Negative Affectivity

OR: Odds Ratio

PAD: Peripheral Arterial Disease

PCI: Percutaneous Coronary Intervention

PTSD: Post-traumatic Stress Disorder

RAG: Roles and Goals Questionnaire

RLOC: Recovery Locus of Control Scale

RR: Relative Risk

SAC: Stress Arousal Checklist

SBP: Systolic Blood Pressure

SCA: Sudden Cardiac Arrest

SI: Social Inhibition

SNSS: Quality of Social Network and Social Support Scale

SD: Standard Deviation

TPB: Theory of Planned Behaviour

TPR: Total Peripheral Resistance

Chapter 1: Introduction

Cardiac Disease: Prevalence Rates and Established Risk Factors

1.0 Overview

The current chapter introduces the topic of cardiac disease. It describes the prevalence of cardiac disease in the UK, including the economic implications. Section 1.2 outlines the established risk factors for coronary heart disease (CHD) including, smoking, unhealthy diet, alcohol consumption, diabetes, and elevated blood pressure and blood cholesterol. The development of CHD is then described, followed by treatments for myocardial infarction (MI), and recovery following an MI. The concluding sections relate specifically to the aims and structure of the thesis.

1.1 Prevalence of Coronary Heart Disease

CHD is the most common cause of premature death in the UK, causing 21% of premature deaths in men and 12% of premature deaths in women. It is estimated that one in five men and one in six women die from the disease (British Heart Foundation, 2007). In 2006, CHD caused just over 100, 000 deaths in the UK. Although there has been improvement in the death rate from coronary heart disease in the UK in recent years (Fox et al, 2007), it remains one of the highest in the world. In addition, a large number of people in the UK are now estimated to be living with heart disease, estimated at just under 2.7 million people (British Heart Foundation, 2007).

The majority of deaths from CHD are because of a heart attack (also known as myocardial infarction or MI). 270, 000 people suffer a heart attack in the UK each year, resulting in 117, 000 deaths. It is estimated that almost 1.3 million people are living in the UK who have had a heart attack (British Heart Foundation, 2007).

Furthermore, the World Health Organisation MONICA Project which monitored the trends and determinants of cardiovascular disease (CVD) found that the incidence rates of heart attack in the two UK populations in the study, Belfast and Glasgow, were among the highest in the world (Tunstall-Pedoe et al, 1999).

The economic costs of CHD to the health service are considerable, costing an estimated £1,750 million each year. In addition, CHD costs the UK economy around £5,300 million each year because of days lost to death, illness and informal care of people with the disease (British Heart Foundation, 2007).

Due to advancements in the treatment of CHD more people are now surviving heart attacks and other cardiac events (Fox et al, 2007), meaning that there are large numbers of people in the UK now living with CHD. This presents a new problem as CHD can have a long lasting impact on affected individuals and their families in terms of both physical and psychological adjustment and quality of life (e.g. Frasure-Smith & Lesperance, 2003). It is, therefore, important to investigate the aetiological factors and determinants of psychological outcome in cardiac patients, which are the central aims of this thesis.

1.2 Established Risk Factors for Coronary Heart Disease

There are a number of well-known and well established medical risk factors for CHD, it is these factors which guide current prevention efforts for CHD. Smoking is an important risk factor and it is estimated that smoking causes more than 30,000 deaths per year from CVD. Additionally, second-hand smoke is also harmful, with regular exposure increasing the risk of CHD by 25% (British Heart Foundation, 2007).

Unhealthy diet, consisting of high fat and salt intake combined with low fruit and vegetable consumption represents a further reason why CHD rates are high in the UK (British Heart Foundation, 2007). Lack of physical activity is also important as physical activity lowers the risk of CHD. In recent years the levels of physical activity have declined in the UK, with only 37% of men and 25% of women doing enough exercise to meet the current recommendations of 30 minutes of activity five times a week (British Heart Foundation, 2007).

It is estimated that about 43% of men, and 34% of women are overweight in the UK, and a further 22% of men, and 23% of women are obese. Being overweight (a BMI of 25-30kg/m²) or obese (a BMI of more than 30kg/m²) increases the risk of CHD as it is associated with raised blood pressure and the development of diabetes (British Heart Foundation, 2007). With regards to alcohol, although moderate alcohol consumption is claimed to be associated with a reduced risk of CHD (e.g. Rimm et al, 1999), high levels of intake, particularly in 'binges' are associated with increased risk of CHD. It is estimated that 38% of men and 23% of women in the UK drink more that the daily recommended limits of no more than four units of alcohol in men, and three in women (British Heart Foundation, 2007). Diabetes also substantially increases the risk of CHD, currently around 3% of adult men and women are thought to have diabetes, this figure has been rising rapidly in recent years (British Heart Foundation, 2007). Elevated blood pressure and blood cholesterol are also directly related to CHD. Thirty-seven per cent of men and 34% of women have raised blood pressure, and about 60% of people have blood cholesterol levels above the recommended level (British Heart Foundation, 2007). There is also a strong genetic component of CHD,

with many heart conditions being influenced by hereditary factors (e.g. Freidlander, Kark & Stein, 1985).

Although these are all important risk factors for CHD, they provide an incomplete account of the causes of CHD. Therefore, it is important to also consider psychological factors, such as, personality, social support and depression, which have an important role in the development of CHD. These factors will be described in further detail in Chapter 2.

1.3 The Development of Coronary Heart Disease

This thesis focuses on one manifestation of coronary heart disease, myocardial infarction (MI). An MI is caused by atherosclerosis of the blood vessels, the process through which deposits of fatty substances, cholesterol, cellular waste products, calcium and other substances build up in the inner lining of an artery. This develops into an atherosclerotic plaque (Weissberg, 2000). Atherosclerosis can remain clinically silent due to positive remodelling of the vessel, during this time the vessel will expand as the plaque grows, this expansion preserves both the lumen diameter and blood flow. Therefore, it is possible for large atherosclerotic lesions to accumulate without a resulting effect on blood flow or symptoms (Davies et al, 2004).

Atherosclerosis will remain clinically silent until one of two events occurs; (1) the lesion expands to the point at which it limits blood flow, resulting in symptoms of reversible ischaemia during exertion, known as angina, or (2) the fibrous plaque ruptures causing the exposure of sub-endothelial collagen and lipid. The latter event can lead to a condition in which platelets are prone to activation, the coagulation

system is in a prothrombotic state, and high levels of circulating inflammatory factors are present (Naghavi et al, 2003). This may result in the formation of a thrombus that blocks the artery, stopping it from supplying blood to the region of the heart that it supplies, resulting in an MI (Davies et al, 2004).

Reported symptoms at the time of an MI often include, central crushing chest pain, a feeling of heaviness or discomfort in the left arm, and collapse. Other patient reported symptoms include; shortness of breath, nausea and vomiting, palpitations, feeling faint, dizzy or weak, stomach upset, indigestion-like abdominal discomfort, flu-like symptoms, pain in the jaw/head/shoulder/back, or feelings of panic (American Heart Association, 2007). However, there are problems with delayed presentation in MI patients, with only 15% of patients coming to hospital within 1 hour of experiencing symptoms (Norris, 1998), due to a mismatch between expected and experienced symptoms (O'Carroll et al, 2001).

1.4 Treatment for MI

Recent advances in treatment have significantly improved survival rates in MI patients (Fox et al, 2007). Specifically, the advent of thrombolytic therapy (the injection of clot dissolving medication into the artery) has greatly improved survival rates by enabling blood flow to be restored to the myocardium (van Domburg, Boersma & Simoons, 2000). Patients who receive thrombolytic therapy within the first hour after symptoms begin were shown to be 50% more likely to survive the first year following an acute MI (AMI) (GISSI, 1986). An alternative procedure also used to relieve obstruction or reduce narrowing in coronary arteries is coronary angioplasty. The procedure involves a small balloon catheter being inserted into the artery and

advanced to the narrowing; here the balloon is inflated and removed, leaving in place a rigid support (stent) to keep the blood vessel open. Angioplasty has been shown to be a very effective treatment in MI patients, indeed some research has found it to be superior to treatment by thrombolysis in patients with AMI (e.g. Andersen et al, 2003). A further treatment used in some MI patients is coronary artery bypass graft (CABG), this procedure creates a bypass around the blocked part of the coronary artery to restore the blood supply to the heart muscle. Again, this treatment has high rates of clinical effectiveness (Serruys et al, 2001).

1.5 Recovery and Quality of Life Following MI

Advancements in the treatment of cardiovascular disease has led to a shift from hard endpoints (such as mortaility or repeat MI), to include the patient's perspective; prolonged survival is no longer the 'be all and end all' but also the quality of life of the patient has become important (Pedersen et al, 2007). As stated by Lesperance & Frasure-Smith (1999) 'When we begin to see improved survival as the gold standard for judging the value of psychological and psychiatric treatments, we have missed the point both practically and philosophically'. With this shift in outcomes, it is important to identify patients at risk of impaired functioning and quality of life. As stated earlier, it is estimated that there are currently 1.3 million people living in the UK who have experienced an MI (British Heart Foundation, 2007) Therefore, prospective studies are required which aim to identify important predictors of outcome (including both hard and soft endpoints) in MI patients. The simple outcome measure of mortality is insufficient in assessing the real and full picture of the effect of experiencing an MI on patients overall well-being.

There is little evidence linking key medical variables, such as left ventricle ejection fraction, to quality of life (e.g. Gorkin et al, 1993). It is therefore important to focus on the role of psychological factors, such as negative emotions, personality and health-related cognitions. These factors will be described in more detail in Chapter 2. Indeed, studies have shown that cardiac patients may suffer from a wide-range of psychological sequelae following a cardiac event, including poor perceived health, anxiety, depression, and posttraumatic stress disorder (PTSD) (Ladwig et al, 1991; Kutz et al, 1994; Frasure-Smith, Lesperance & Talajic, 1995; Duits et al, 1997). Moreover, these sequelae have been shown to have a negative prognostic impact independent of disease severity (Berkman, Leo-Summers & Horwitz, 1992; Hemingway & Marmot, 1999).

1.6 Aims of the Thesis

The primary aim of this thesis is to investigate patient outcome following an MI by identifying predictors of psychological wellbeing and quality of life in a prospective cohort of patients who have been admitted to hospital following an MI. It will investigate the role of Type D personality, future thinking, and role and goal investment in predicting psychological distress, quality of life, and functional outcome post-MI. In addition, the role of Type D personality and patients' beliefs will be examined in relation to medication adherence. The thesis will also examine the association between several key psychological variables; locus of control, illness perceptions, and optimism, and whether they are predictive of outcome post-MI. Within the context of identifying predictors of outcome, a particular focus is placed on the role of personality. The concept of Type D personality (the joint effects of social inhibition and negative affectivity), an emerging risk factor in CHD, is

investigated. It is of importance to determine if it is an important predictor of outcome in the current sample of MI patients. Specifically, studies will be conducted to investigate the prevalence and stability of the Type D construct in both healthy and cardiac populations in the UK. In addition, these studies seek to investigate potential mechanisms by which Type D may lead to adverse prognosis in cardiac patients.

Therefore, the aims of the thesis are:

(i) To investigate predictors of psychological outcome post-MI.

(ii) To determine the prevalence and stability of Type D Personality in the UK.

(iii) To determine if personality is predictive of psychological outcome after controlling for mood, and demographic and clinical factors.

(iv) To investigate potential mechanisms which may explain the link between personality and adverse outcome in cardiac patients.

1.7 Thesis Structure

The literature review in Chapter 2 focuses on the psychological variables which are utilised in the thesis in order to predict outcome post-MI. This focuses on established cardiovascular psychological risk factors, such as depression and anxiety, 'newer' cardiovascular risk factors such as Type D personality and variables which have been shown to be important in other patient groups, which are utilised in a cardiovascular setting for the first time, for example, prospective thinking and role and goal investment. Chapter 3 describes the psychological model underpinning the thesis, Leventhal's Self Regulation model, and how the variables described in Chapter 2 are operationalised in this model. Chapter 4 provides an overview of the methodology of the thesis. Specifically, this provides a detailed summary of each of the measures

being used in each of the five studies that are described. Chapters 5, 6 and 7 are experimental chapters and report the findings from studies focussing on one particular emerging risk factor for cardiovascular disease, Type D personality. These studies aimed to identify possible mechanisms through which Type D may lead to poor outcome in cardiac patients. Chapter 8 presents the results of the clinical study, presenting the baseline measures, and the results of the follow-up assessment at 3 months in a prospective cohort of MI patients. A flow diagram of the studies is presented in Figure 1.1. Chapter 9 provides a general discussion of the findings of the thesis and their implications for research and clinical practices. It also reviews the strengths and limitations of the research, and suggests possible areas that may be developed in future research.

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|                      Study 1                              |
| Prevalence of Type D personality in the UK and Ireland:   |
| Associations with health behaviour and social support     |
+-----------------------------------------------------------+
                            |
                            v
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|                   Study 2 and 3                           |
| Type D personality, health behaviour and social support:  |
| Further evidence                                          |
+-----------------------------------------------------------+
                            |
                            v
+-----------------------------------------------------------+
|                      Study 4                              |
| Type D personality and cardiovascular reactivity to stress|
+-----------------------------------------------------------+
                            |
                            v
+-----------------------------------------------------------+
|                      Study 5                              |
| Predictors of psychological outcome post myocardial       |
| infarction: A prospective study                           |
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Figure 1.1 Flow diagram depicting the experimental studies which make up the thesis

Chapter 2: Literature Review

Psychosocial Risk Factors in Coronary Heart Disease

2.1 Psychosocial Risk Factors in CHD

As outlined in Chapter 1, there are a number of established medical risk factors for CHD. However, medical risk factors alone are not sufficient to explain all the cases of CHD. Therefore, it is important to outline the main established psycho-social risk factors in CHD, these are, socio-economic status, job strain, social isolation, depression and anger and hostility. Each of these is described in more detail in the following sections.

2.1.1 Socio-economic Status

Socio-economic status (SES) indicators, including income, occupation and education have been associated with CHD, in terms of both morbidity and mortality. Morrison et al (1997) investigated the effect of socioeconomic group on incidence of, management of, and survival after MI in a Scottish sample. They found that event rates increased 1.7-fold in men, and 2.4-fold in women from the least to the most deprived SES group. These findings were replicated 4 years later by Macintyre et al (2001) who investigated the relationship between SES and death from an MI in Scotland. They found that socioeconomic deprivation had an effect on the risk of having a first MI, the chance of reaching hospital alive, and the probability of surviving the first month. For example, those experiencing the most deprivation had twice the risk of having a first MI, and of dying before reaching hospital.

More recently, a study undertaken in Finland reported similar results. Manderbacka et al (2006) again reported that the lower the SES group the higher the risk of death from

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MI. Recent research has also investigated the influence of SES on quality of life in cardiac patients who have undergone percutaneous coronary intervention. Results demonstrated that patients with low SES had lower quality of life at baseline and 12 months (Denvir et al, 2006).

With regards to education, studies have demonstrated an inverse relationship between education and long term risk of CHD. For example, Mayer et al (2004) investigated the relationship between educational level and the risk profile of 5556 patients. They reported that significantly more patients with ischaemia had only primary education. In addition, men with the highest education were found to have significantly lower systolic blood pressure and cholesterol compared to those with a lower education level.

A similar pattern is observed for income. Salomaa et al (2000) investigated the relationship between SES and the mortality rates of MI patients. They reported that among men with their first MI, the adjusted incidence ratios were 1.67 and 1.84 in the low and middle income categories compared to the high income categories. More recently, Ljung & Hallqvist (2006) sought to examine the impact of SES position over the lifetime and the risk of MI. The relative risk of having an MI was 2.36 for men, and 2.54 for women who had been in an adverse SES position throughout their life, compared to those who had never been.

SES is thought to have this effect through a number of mechanisms. For example, those in better off social positions have better access to care and to knowledge and resources relating to health (Kirby & Kaneda, 2005). Indeed, studies have

demonstrated that underprivileged groups are less likely to receive invasive and diagnostic procedures and are more likely to experience delays in these types of care (e.g. Alter et al, 1999). Furthermore, people from lower socioeconomic groups are also known to be more likely to smoke, exercise less, and be obese, all of which are important risk factors for CHD (Erkkila et al, 1999).

Importantly, recent studies have reported that socioeconomic differences seem to be increasing (e.g. Valkonen et al., 2000). Therefore, it is important for studies to continue to investigate SES, and to consider psychosocial factors which explain why these differences seem to be increasing.

2.1.2 Job Strain

The job-strain model postulates that a combination of high psychosocial demand (the need to work quickly and hard) and low control (lack of control over skill use, time allocation and organisational decisions) (Karasek, 1979) is related to cardiovascular risk (Schnall, 1994). Research has demonstrated job strain to be associated with CHD and hypertensive risk in a number of occupations (Bosma et al., 1997; Goldstein et al., 1999; Steptoe et al., 1996).

Research has shown that occupations characterised by low control have increased CHD mortality (Marmot & Theorell, 1988). Evidence from the Whitehall II study demonstrates that low decision latitude is associated with increased incidence of CHD over 5 years, independently of measures of socioeconomic status (Bosma et al, 1997). A more recent study of the same sample by Kuper and Marmot (2003) sought to extend the earlier work by Bosma and colleagues by investigating the full job strain

model in relation to CHD events. They reported that those individuals who were simultaneously low on decision latitude and experienced high demands were at the highest risk of CHD. In addition, the separate components of the model, job demands, and to a lesser extent decision latitude also predicted incidence of CHD.

Further evidence for the association between job strain and CHD risk comes from a prospective cohort study of industrial employees (Kivimaki et al, 2002). They found that high job strain was associated with a two-fold increased risk of cardiovascular death compared to individuals with low job strain at 25-year follow-up. In addition, this finding remained significant after controlling for biological and behavioural risk factors at baseline. Furthermore, in one study of work related stressors, upcoming deadlines were associated with a six fold increase in myocardial infarction (Johansen et al, 2002).

Research has also been carried out to examine the effects of job strain on blood pressure in difference occupational groups. For example, O'Connor, O'Connor, White and Bundred (2000) found that general practitioners who experienced high job strain had elevated blood pressure levels, compared to their low strain counterparts. More recently, Guimot et al (2006) reported that cumulative exposure to job strain led to significant increases in systolic blood pressure among male white-collar workers. Research has also demonstrated that job strain is associated with increased atherosclerosis in young males (Hintsanen et al, 2005).

2.1.3 Social Support

Lack of social support is a leading psychosocial risk factor for CHD. Social support can refer both to the number and quality of a person's social contacts (including emotional and confiding support). Initial reports of the role of social support in health came from the investigators of the Alameda County Study (Berkman & Breslow, 1983). Since then, studies have been carried out to investigate the relationship between the lack of social support and cardiovascular disease incidence. Orth-Gomer, Rosengren & Wilhelmsson (1993) found that lack of social support was associated with an increased future risk of an acute myocardial infarction and death from CHD at 6 year follow-up in a population of healthy middle-aged Swedish men. More recently, a 15 year follow-up investigation of this same sample of healthy middle-aged Swedish men was published. Again, social support was predictive of coronary morbidity (Rosengren, Wilhelmsson & Orth-Gomer, 2003). The concept of social support is described in more detail in Section 2.2.2.

2.1.4 Depression

Depression has been linked with the development and progression of CHD, For example, depression has been associated with a 3-4 fold increase in cardiac mortality over the first 18 months following an MI (Frasure-Smith, Lesperance & Talajic, 1995a). Several substantial literature reviews (e.g. Kuper, Marmot & Hemingway, 2002; Frasure-Smith & Lesperance, 2005; Frasure-Smith & Lesperance, 2006) have considered the evidence for the link between depression and the development of CHD in initially disease-free individuals. These reviews have concluded, that despite some variability in outcomes, depression is a consistent risk factor for both the aetiology

and prognosis following CHD. The role of depression as a prognostic risk factor in CHD is described in more detail in 2.2.1.

2.1.5 Anger and Hostility

The deleterious effects of anger and hostility on cardiovascular health have also been investigated. For example, trait anger has been positively associated with blood pressure and cardiovascular reactivity (Durel et al, 1989; Siegman et al, 1992). Prospective studies have also demonstrated a relationship between anger and the development of CHD (Williams et al., 2000; 2001). Investigators from the Framingham Heart Study reported that suppressed anger independently predicted the 8-year incidence of CHD among both men and women (Haynes, Feinleid & Kannel, 1980). In addition, Kawachi et al (1996) report findings from the Normative Aging Study of a 3-fold increase in CHD risk among individuals with the greatest difficulty controlling their anger. More recently, Williams et al (2000) demonstrated that proneness to anger in normotensive middle-aged men and women predicted CHD morbidity and death independent of established biological risk factors. In a further study, Williams et al (2001) demonstrated that a strong, angry temperament puts normotensive, middle-aged persons at increased risk for cardiac events and may confer a CHD risk similar to that of hypertension.

Hostility has also been implicated in the development of CHD. For example, an early study from Williams et al (1980) established an association between hostility and the severity of coronary atherosclerosis in patients undergoing coronary arteriography. A further study by Barefoot, Dahlstrom & Williams (1983) found an association between the hostility scores of healthy young men and the incidence of CHD over the

subsequent 15-year interval. More recently, Niaura and colleagues reported findings from the Normative Aging Study which demonstrated that healthy individuals with high levels of hostility were at the greatest risk for the development of CHD, independent of the effects of traditional CHD risk factors, such as body mass index (BMI) and blood pressure (Niaura et al, 2002).

The above section serves to highlight the potential importance of psychological factors (in addition to the medical factors described in Chapter 1, Section 1.2) to the development of CHD. As the purpose of this thesis is to examine predictors of outcome post-MI, the following section outlines the psychological factors that will be examined during the thesis. Many of these factors are established prognostic risk factors in CHD, such as depression, social support and adherence. Others are emerging risk factors, for example Type D Personality, and others are factors which are important in other health domains and may have utility as predictors of outcome in the area of CHD.

2.2 Established Psychological Predictors of Outcome Post-MI

The following section describes established psychological predictors of outcome post-MI; these factors are investigated in the main clinical study described in Chapter 8.

2.2.1 Depression and Anxiety

Symptoms of depression and anxiety are prevalent in patients with MI (e.g. Crowe et al, 1996). Several studies have demonstrated that depression and anxiety predict subsequent mortality in MI patients (e.g. Frasure-Smith, Lesperance & Talajic, 1993; Moser & Dracup, 1996). A study conducted among MI patients in Canada, published

in a series of articles by Frasure-Smith, Lesperance and Talajic (1993, 1995a, 1995b, 1996) has examined the role of anxiety and depression on cardiac events. At 6-month follow-up after acute MI, major depression and elevated Beck Depression Inventory (BDI) scores predicted cardiac mortality. At 18-month follow-up, again both major depression and elevated BDI scores were related to cardiac mortality, although only the BDI prediction remained significant after controlling for other clinical variables. In the same study, anxiety emerged as a predictor of recurrent cardiac events, independent of depression.

Research has also examined the effects of depression and anxiety on quality of life of patients after MI. Patients who are depressed after a MI are less likely to return to work (Schleifer et al, 1989), or to resume sexual activity (Stern, Pascale & Ackerman, 1977). Conn, Taylor & Wiman (1991) specifically examined the quality of life in MI survivors, they found depression to be the single best predictor of quality of life, accounting for 49% of the variance. In addition, further studies have found that both anxiety and depression predicted quality of life at 4 months (Lane et al, 2000) and 1 year in MI patients (Mayou et al, 2000). In addition, Lane et al (2002) have demonstrated that symptoms of depression and anxiety are a persistent problem during the first year following MI, with prevalence rates of 37.2% for depressive symptoms and 40% for symptoms of anxiety. The role of depression and anxiety after MI is described in further detail in Section 8.1.1.

2.2.2 Social Support

As described in section 3.1.3, lack of social support has also been associated with adverse prognosis in cardiac patients. Indeed, systematic reviews and meta-analyses

have consistently concluded that social support is among the most robust risk factors for CHD (e.g. Berkman, 1995; Kuper, Marmot & Hemingway, 2002). For example, a review from Hemingway & Marmot (1999) found the magnitude of the risk for lack of social support on all cause mortality ranges from 1.33 to 5.62 after adjusting for cardiac disease severity. In addition, a more recent review by Lett et al (2005) concluded that low social support confers a risk of 1.5 to 2.0 in both healthy populations and in patients with CHD.

The beneficial effect of social support on CHD is thought to be the result of either healthier lifestyles among those who have a supportive network, or social support acts as a buffer against the deleterious effects of life events and stress (Hemingway & Marmot, 1999).

A series of prospective studies carried out with initially healthy individuals have provided evidence in support of social support as a predictor of the onset and progression of CHD. Studies have demonstrated a relationship between low perceived emotional support and increased CHD incidence (Orth-Gomer, Rosengren & Wilhelmson, 1993; Rosengren, Wilhelmson & Orth-Gomer, 2004). Research has also highlighted the relationship between structural support (e.g. the number of social contacts, marital status, living arrangements) and initial cardiac events, and mortality due to CHD (Eng et al, 2002; Kaplan et al, 1988; Vogt et al, 1992).

Prospective studies have also been carried out with CHD patients to determine the impact of social support on health outcomes. For example, Berkman, Leo-Summers and Horwitz (1992) found that perceived emotional support was a predictor of

mortality in a sample of 194 MI patients. Similarly, Gorkin et al (1993) found that perceived availability of needed support was associated with a hazard ratio of 1.46 for subsequent mortality in nearly 700 MI patients. However, Frasure-Smith et al (2000) did not find a main effect of perceived social support in their sample of 887 MI patients, but instead found an interaction with depression. Specifically, depressed patients with low perceived social support were at the greatest risk for mortality during the first year post-MI.

Research has also been carried out with CHD patients to determine the effect of structural support on outcome. Williams et al (1992) demonstrated that individuals with CHD who were unmarried, or without a confidant had a relative risk of 3.34 compared to those who were married or had a confidant. The same pattern of results was also found in MI patients (Case et al, 1992). Furthermore, Brummett et al (2001) found that low network size was associated with a hazard ratio of 2.43 for cardiac mortality in a 4-year follow-up study of CHD patients.

A number of studies have found that patients with a lack of social support report more cardiac symptoms compared to those with high levels of social support (Fontana et al, 1989; Lindsay et al, 2001, Pedersen, Van Domburg & Larsen, 2004). MI patients with low social support also have more difficulty in changing maladaptive health-related behaviours (Conn, Taylor & Hayes, 1992).

More recently, low levels of social support have been associated with CHD in a number of studies. For example, Pedersen, Van Domburg & Larsen (2004) investigated the effect of social support on the short-term prognosis in MI patients.

They reported that lower social support at baseline was associated with a 10% increased risk of cardiac events at follow-up 9 months later. In addition, Petersson et al (2007) reported that low social support at work was an independent predictor of MI and stroke in women.

However, inconsistency regarding how social support has been defined and measured has restricted efforts aimed at fully understanding the relationship between social support and CHD, and consequently has impacted the design of effective interventions. For example, few studies have simultaneously compared different types of social support, therefore it is difficult to pinpoint which types of support are most associated with CHD (Lett et al, 2005).

2.3 Health-Related Cognitions

The following section outlines each of the cognitive variables that are examined in the thesis. Patients' beliefs and perceptions concerning their illness have shown to be important predictors of outcome in a number of patients groups (Petrie & Weinman, 1998). This thesis investigates established health-related cognitions, including illness perceptions, locus of control, and medication beliefs. These factors have been shown to be important determinants of outcome in a variety of health contexts (e.g. Johnston et al., 2004; Petrie et al, 1996). However few studies have examined their impact on outcome prospectively in MI patients. This thesis will therefore address this gap in the literature. In addition, this thesis examines the role of future thinking and role and goal investment in predicting psychological outcome post-MI. These variables have been shown to be important predictors of psychological distress and adverse mental health in several patient groups, including patients with physical illness. Therefore, it

is of interest to investigate future thinking and role and goal investment in MI patients, to determine if these cognitions play a role in predicting outcome in MI patients.

2.3.1 Illness Perceptions

The common-sense model of self-regulation (Leventhal et al, 1980) has been utilised extensively within health psychology to predict health and illness behaviour (see Chapter 3, Section 3.4.2). The central component of this model is concerned with the individual's illness perceptions which are thought to be organised in terms of five components. These components are; beliefs about (a) the causes of the illness; (b) identity (i.e. symptoms that the patient associated with the illness); (c) the consequences of the illness; (d) time line (i.e. whether the patient believes the illness will be acute, chronic or cyclical); and (e) ways to control or cure the illness.

Petrie et al (1996) identified that patients' perceptions of illness, assessed shortly after their MI, had important effects on recovery. For example, patients who believed that their MI would have more serious long-lasting consequences were found to have higher levels of illness-related disability and were slower to return to work. Additionally, patients who had weaker beliefs in the control or cure of their heart condition were less likely to attend cardiac rehabilitation (Petrie et al, 1996; Cooper et al, 1999; Whitmarsh, Koutanjti & Sidell, 2003).

Further research demonstrates that illness perceptions measured within 24 hours of an acute MI were predictive of quality of life at 6 month follow-up (French et al, 2005). While the majority of studies investigating illness perceptions have relied on completion of the Illness Perception Questionnaire (IPQ; Weinman et al, 1996), or the

IPQ-R (Moss-Morris et al, 2002), a study conducted by Broadbent et al (2004) asked MI patients to draw pictures of their heart in order to assess the patients' ideas of the extent of damage to their heart. They found that the patients drawing of damage to their heart was a better predictor of recovery at 3 months than medical indicators of damage. In addition, a large amount of research has focussed specifically on patients' beliefs concerning the causes of their MI. The evidence suggests that causal beliefs are predictive of outcomes up to eight years later (Affleck et al, 1987; Low et al, 1993; Weinman et al, 2000).

More recently, French, Cooper and Weinman (2006) carried out a systematic review and meta-analysis of research which has examined the relationship between illness perceptions and attendance at cardiac rehabilitation following MI. They reviewed a total of eight studies (N=906 patients). It was found that four illness perception constructs were significant predictors of attendance at cardiac rehabilitation. They were; patients with more positive identity, cure/control, consequences and coherence. However, it was also concluded that effect sizes are often small. Therefore, this review did provide some support for the role of illness perceptions in predicting attendance at cardiac rehabilitation.

In addition, Petrie et al (2002) have demonstrated that it is possible to alter the illness perceptions of MI patients, thus offering a potential route for interventions. They carried out a randomised control and found that a brief hospital intervention with patients aimed at altering their perceptions about their MI was successful in changing patients' view of their MI. This change meant that these patients returned to work

more quickly and experienced fewer angina symptoms compared to those patients in the control condition.

Given these promising findings linking illness perceptions to recovery in cardiac patients, including those who have experienced an MI, the clinical study described in Chapter 8 will utilise a measure of illness perceptions. It is of interest to determine which illness perceptions have utility in predicting short-term outcome following MI.

2.3.2 Locus of Control

Linked to the idea of patients' perceptions of their illness is the concept of locus of control. Individuals differ as to whether they tend to regard events as controllable by them (an internal locus of control) or uncontrollable by them (external locus of control). Wallston & Wallston (1982) have developed this concept for use within health domains. Health locus of control refers to whether individuals believe their health is controllable by them, not controllable by them and in the hands of fate, or whether they regard their health as being under the control of powerful others (e.g. doctors).

A number of studies have indicated the positive affect of patients' perceptions of control in cardiac disease (e.g. Affleck et al., 1987). The concept of locus of control has also been investigated in relation to attendance at cardiac rehabilitation, Cooper et al (1999) found that patients with a stronger belief that their condition is controllable were more likely to attend cardiac rehabilitation compared to those who believed less strongly that their condition was controllable. In addition, Sturmer, Hasselbach and Amelang (2006) demonstrated that a high internal locus of control was associated

with a decreased risk of MI in a large population based cohort at eight year follow-up. Furthermore, in a study designed to examine factors which were implicated in delayed presentation in MI patients, O'Carroll et al (2001) demonstrated that the belief that health is due to chance factors was the best predictor of delayed attendance.

In addition, there is some evidence to suggest that locus of control is related to specific health-related behaviours which are relevant to CVD. Steptoe and Wardle (2001) investigated the relationship between locus of control and ten health-related behaviours in young adults from 18 countries. They found that the odds of carrying out healthy activities were 40-70% greater in those with high locus of control. However, the findings linking locus of control and health behaviours have been inconsistent (Norman & Bennett, 1995).

A series of studies by Johnston and colleagues have examined the impact that patients' recovery locus of control have on outcome. For example, Johnston et al (1999) found that stroke patients who held internal recovery locus of control beliefs, that is beliefs that their recovery was attributable to themselves, were less disabled six months following stroke. An earlier study by Partridge and Johnston (1989) which introduced the Recovery Locus of Control scale found that greater internality was associated with faster recovery in stroke patients, and patients who had a fractured wrist. Orbell et al (1998) also found a similar pattern of results in joint replacement patients. More recently, Johnston et al (2004) found that perceptions of control 6 months after discharge predicted recovery from stroke at 3 years.

There is a relative lack of studies which have utilised locus of control as a predictor of outcome after a cardiac event prospectively. This thesis will therefore address this gap in the literature and examine the association between locus of control and illness perceptions in a prospective cohort of MI patients.

2.3.3 Medication Adherence and Beliefs

Medications such as beta-blockers, and cholesterol lowering medication are known to reduce mortality and morbidity rates in MI patients. Adherence to prescribed medication is therefore very important for MI patients in aiding their recovery. For example, Horwitz et al (1990) found that MI patients who took >75% of prescribed medication were more than three times as likely to have survived after one year compared to patients who took <75%. However, adherence to medication has been found to be quite poor across a range of patient groups and time periods. DiMatteo et al (1992) demonstrated that 20% to 30% of patients are non-adherent to short-term medication. In addition, for long term medication, the rate of non-adherence is higher, with about 50% of patients failing to follow the prescribed regime (Benner et al, 2002). Osterberg & Blaschke (2005) have reported six general patterns of medication taking among patients with a chronic illness. They report that approximately one sixth come close to perfect adherence; one sixth take nearly all doses but with some timing irregularity; one sixth miss an occasional single day's dose; one sixth take drugs holidays (when they take no medication) three to four times a year, with occasional omission of doses; one sixth have a drugs holiday monthly or more often, with frequent omissions of doses; and one sixth take few or no doses while giving the impression of good adherence.

It should also be noted that measuring adherence to medication is problematic (Gordis, 1979). Indeed, adherence to medication has been measured in a number of different ways. A direct measurement of concentrations of a drug, its metabolite or a biologic measure in the blood or urine is the most accurate way of assessing adherence. However, it is expensive and impractical in many situations. There are problems associated with all methods of measurement of adherence. For example, performing pill counts does not take into account patients discarding of pills to give the impression of compliance. Rates of refilling prescriptions or electronic medication monitors can be used, but they do not prove the medication has been used correctly. The method that is most commonly used is that of self-report measures, these can be subject to social desirability bias as the patient wants to please the researcher, resulting in over-estimations of compliance. However, if a supportive and non-punitive atmosphere is created then this can help to gain a more accurate picture of patient adherence (Horne, 2000). For example, the Medication Adherence Response Scale (MARS; Horne, 2000), attempts to diminish the social pressure on patients to under report non-adherence by framing adherence questions in a non-threatening manner, 'Many people find a way of using their medicines which suits them. This may differ from the instructions on the label of from what their doctor has said. We would like to ask you a few questions about how you use your medicines'.

A number of predictors of poor adherence have been identified. These can generally be related to either intentional or unintentional non-adherence. Unintentional non-adherence is usually due to capacity and resource limitations that prevent patients from following treatment recommendations. For example, individual constraints such as, memory or dexterity and environmental constraints such as problems accessing

prescriptions and cost could prevent patients taking their medication. Intentional non-adherence arises from beliefs, attitudes and expectations that influence the patients motivation to take their medication in a particular manner.

A number of qualitative studies have shown that people possess beliefs about medicines in general (e.g. Britten, 1994), as well as beliefs about medicines prescribed for a specific illness (e.g. Morgan & Watkins, 1988). Horne, Weinman & Hankins (1999) have developed the Beliefs About Medicines Questionnaire to assess both the general and specific beliefs that patients have about medicines. Two major themes emerged for beliefs about medicines in general (Horne, 2000). The first is 'General-Harm', patients hold a variety of beliefs about the dangers of prescribed medications. For example, fears of experiencing harmful side-effects and concerns about addiction and dependence. These concerns are relevant across a range of disease states and are typically endorsed by over a third of participants (Horne & Weinman, 1999). The second theme is 'General-Overuse' and refers to beliefs about the way in which medicines are used and the extent to which the patient believes that medicines are over-prescribed by doctors. Two themes also emerged for beliefs about specific prescribed medication. The first is necessity beliefs, the patients' views about the necessity of the medication for maintaining and improving health. The second is concerns, and comprises beliefs about the potential adverse effects of taking medication.

Beliefs about medications are therefore assessed in the patient study to investigate their role as predictors of medication adherence in MI patients. In addition, the study will determine how beliefs about medicines and adherence is associated with illness

perceptions, locus of control and Type D personality. More information on adherence in cardiac patients is given in Section 8.1.3.

2.3.4 Future Thinking

An individual's negative view of the future as characterised by their ability to generate positive and negative thoughts about the future has been widely assessed within the area of psychological distress, including depression and suicidality (MacLeod et al, 1997; O'Connor et al, 2007). A series of studies by MacLeod and colleagues have demonstrated that a lack of positive future thinking, rather than increased negative future thinking, is an important risk factor for psychological distress, hopelessness and suicide risk (MacLeod et al, 1997; MacLeod & Moore, 2000). They investigated samples of suicidal patients and compared them to matched control groups. Suicidal patients were found to be impaired in the number of positive events they were looking forward to, but did not show an increase with regards to future negative events. Given that it is normally the role of negative experiences in mental health which are investigated, these findings suggest that positive, as well as negative aspects of experience should be taken into account when attempting to understand psychological disorders (MacLeod & Moore, 2000).

MacLeod and colleagues have investigated future cognitions using a task based on the verbal fluency paradigm. The future-directed thinking task (FTT; MacLeod et al, 1997) measures the mental accessibility of future positive and negative events. In this procedure, participants are presented with three future time periods and are asked to generate things that they are looking forward to and things that they are not looking forward to during these periods. Results from studies using this task has shown that

depressed patients showed reduced anticipation of future positive experiences, but not increased anticipation of future negative experiences, compared to healthy controls (e.g. Conaghan & Davidson, 2002)

More recently, future thinking has been investigated in other patient groups. Godley et al (2001) investigated the role of future-directed thinking in individuals with eating disorders. They found that bulimics had significantly fewer positive future cognition and significantly more negative future cognitions compared to controls. The role of prospective thinking has also been investigated in women suffering recurrent miscarriage. Magee et al (2003) found that having more negative child-related thoughts and fewer non-child related positive thoughts about the future.

There are few studies which have investigated future thinking within people with physical illness. Therefore, it is not known if the biases in cognitive processing that have been demonstrated in depressed patients are the same or the different in the context of physical health problems. One study that has investigated future thinking in the context of physical illness was undertaken by Moore et al (2006). They investigated future thinking in patients with multiple sclerosis (MS). The aim of the study was to investigate how patients with MS anticipate their future in terms of positive and negative events. They found that MS patients with depression anticipated significantly fewer future positive events than the healthy control group and MS patients without depression. In addition, the three groups did not differ in the total numbers of anticipated future negative events. The results from this study therefore provide evidence that similar to depressed but physically healthy individuals, MS patients are characterised by a lack of positive thoughts about the future, rather than

an increased number of negative events. Conversely, a study by Andersson et al (2007) which investigated future thinking in a population of tinnitus patients found that tinnitus patients generated a greater number of negative future events compared to the controls, and there was no difference between the groups on positive future events.

The results described above link future thinking to psychological distress and adverse mental health in several patient groups, including patients with physical illness. Therefore, it is of interest to investigate future thinking in the context of an MI. One aim of this thesis is to establish if these prospective cognitions also play a role in predicting psychological distress in MI patients, and to determine if future thinking in an MI population follows a similar pattern to that found in previous studies with physically healthy individuals.

2.3.5 Role and Goal Investment

There is also a growing literature which suggests that role and goal investment may be important risk factors for psychological distress, particularly following a significant life event. For example, the central idea of Carver and Scheier's model of self-regulation (1998) is that people live life by identifying goals and behaving in ways aimed at attaining these goals. Oatley & Bolton, (1985) propose a social-cognitive model of depression, in this model, over-investment in one aspect of one's life roles and goals can lead to distress. Specifically, depression will occur when an event disrupts a role that has been primary in providing the basis for a person's self-worth. Crucially, the impact of the specific event will depend on the range of alternative or potential roles available to the individual. The more flexible a person can be in deriving a sense of self-worth in a range of domains (i.e. the compensatory roles and

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goals they have available to them) the lower vulnerability to distress they will have (Champion & Power, 1995). Lam and Power (1991) developed the Roles and Goals Questionnaire (RAG) to assess the degree to which individuals are invested in a range of life roles and goals. The key variable from the measure is the extent to which a person is invested in one goal to the exclusion of all others.

To-date, role and goal investment, as described by Lam and Power (1991), has not been studied in MI patients. However, it would seem a particularly appropriate factor to investigate given that experiencing an MI can significantly affect the patient's life in many ways; patients may be unable to return to work, or be able to take part in their normal social activities. Therefore, it will be important for them to have compensatory roles and goals to use in the absence of their normal activities. Moreover, if individuals are over-invested in roles that they are now unable to fulfil they may be more vulnerable to distress.

To my knowledge only one study has operationalised Lam and Power's (1991) theory within a study of at-risk individuals. In addition to studying the role of prospective cognitions in women with recurrent miscarriage, Magee et al (2003), also investigated the impact of role and goal investment in psychological distress. They found that distress was associated with being over-invested in the goal of becoming a parent, relative to other life roles and goals.

More generally, the importance of achieving one's goals has been investigated in relation to patient well-being and quality of life. For example, Carver and Scheier's self-regulation model (see Chapter 3, Section 3.4.1) proposes that that people live life

by identifying goals and behaving in ways aimed at attaining these goals. A disturbance in the attainment of higher-order or life goals has been shown to be related to quality of life outcomes in cardiac patients on waiting list for angioplasty (Echteld, van Elderen & van der Kamp, 2001) and to be predictive of quality of life and depression four months after MI (Boersma, Maes & van Elderen, 2005). In addition, Oldridge et al (1999) identified that attainment of a self-chosen goal was associated with higher levels of well-being 12 months after MI. Similar research has been carried out by Boersma, Maes & van Elderen (2006) who found that goal disturbance predicted both health-related quality of life, and depression, 4 months after MI.

Therefore, given the promising findings linking goal attainment to outcome in MI patients, investigating role and goal investment, as outlined by Oatley and Bolton (1985) may prove to be a particularly fruitful avenue for research, in identifying predictors of psychological distress post-MI. Moreover, the RAG has not been utlilised previously in MI patients, therefore, the current study will use the RAG in order to determine the importance of role and goal investment in predicting psychological outcome in a prospective cohort of MI patients.

2.4 Personality

The following section outlines the personality variables (optimism and Type D) that are investigated in the thesis. As described earlier (see section 2.2.1), a number of studies have demonstrated that psychological distress is associated with the pathogenesis of CVD, However, few studies examine the contribution of personality

in CVD prognosis. Therefore a key aim of this thesis is to examine the role of optimism and Type D personality in predicting patient outcome post-MI.

<u>2.4.1 Optimism</u>

Optimism refers to the tendency to believe that present or future events will have personally favourable outcomes (Carver & Scheier, 1992). It has been strongly associated with emotional well-being in people with chronic and severe health problems (e.g. Carver et al., 2005). Specifically, in the area of CHD, optimism predicts better physical recovery following coronary artery bypass graft surgery (CABG) (e.g. Scheier et al., 1989; Helgeson, 1999). Scheier et al (1989) demonstrated that CABG patients with higher levels of positive expectancies preoperatively demonstrated a faster rate of recovery after surgery. Similarly, a further study from Scheier et al (1999) CABG patients with more positive expectancies were half as likely to be rehospitalized 6 months later for problems including wound infection, angina and MI. King et al (1998) also found that optimism was related to positive mood status in patients undergoing coronary artery surgery.

Optimism has also been associated with superior emotional well-being after a coronary event (Desharnis et al., 1990; Scheier., et al 1989; Scheier., et al, 1999). Desharnais and colleagues (1990) investigated the relationship between optimism and health-relevant cognitions in patients following an MI. They found that patients high on optimism scored significantly lower on perceived susceptibility, perceived severity and experienced less fear compared to pessimists. Other research has found Optimism to be associated with more successful modification of coronary risk behaviours

(Sheppard, Maroto & Pbert, 1996). More recently, optimism was found to be inversely related to fatigue in patients after MI (Brink & Grankvist, 2006).

The most compelling evidence for a relationship between optimism and CHD comes from a prospective study carried out by Kubzansky et al (2001). They examined the effects of an optimistic versus a pessimistic explanatory style on CHD incidence in the Veteran Normative Aging Study over a 10 year follow-up period. They found that individuals with high levels of optimism had a lower risk of developing coronary heart disease (nonfatal MI and cardiac death) relative to those with high levels of pessimism. Their evidence suggests that an optimistic explanatory style may protect against risk of coronary heart disease.

Relatively few prospective studies have been carried out examining the effect of optimism on psychological outcome and quality of life in MI patients. Therefore, a measure of dispositional optimism will be utilised in the current study in order to uncover further information about the predictive power of optimism in CHD. Specifically, whether optimism is predictive of psychological well-being 3 months post-MI and how optimism is associated with other predictors, particularly future thinking and role and goal investment (which are described in sections 3.4.1 and 3.4.2).

2.4.2 Type D Personality

In part, the paucity of studies which have examined the role of personality in the pathogenesis of CVD is due to inconsistent findings on the Type A behaviour pattern. The Type A behaviour pattern describes individuals who are impatient, excessively

time-conscious, insecure about one's status, highly competitive, hostile and aggressive, and incapable of relaxation (Friedman & Rosenman, 1974). Initial studies on Type A, such as the Western Collaborative Group Study (WCGS; Rosenman et al, 1975) established a correlation between Type A behaviour and the development of CHD in healthy middle-aged men. However, a 22- year follow-up of results from the WCGS study found that Type A behaviour was not predictive of disease progression (Ragland & Brand, 1988). In addition, contradictory findings from other studies (e.g. Shekelle et al, 1985) have led to scepticism towards the Type A construct.

The Type A behaviour pattern is often referred to as a personality type; yet this construct was specifically designed to avoid association with global personality traits. As a result Type A reflects a 'heterogeneous hodgepodge' of behavioural symptoms and signs (Dimsdale, 1988). By contrast, the Type D construct was specifically designed to refer to a homogenous subgroup that is defined by the combination of two broad and stable personality traits that have a clear conceptual basis in psychological theory (Denollet & Van Heck, 2001).

The lack of knowledge surrounding the role of personality in the pathogenesis of CVD led Denollet et al (1995) to propose the idea of the 'distressed' personality type or 'Type D'. The Type D construct describes individuals who simultaneously experience high levels of negative affectivity (NA) and high levels of social inhibition (SI). Type D individuals are, therefore, thought to experience negative emotions (such as anxiety, sadness, anger etc.) across time and situations and inhibit the expression of these emotions in social interactions due to fears of how others may react. Crucially, it is the synergistic effect of high scores on both stable personality traits, negative

affectivity and social inhibition, which is important, suggesting that it is not merely the presence of negative emotions that should be considered as a risk factor but also how an individual copes with these negative emotions. Denollet derived this model from previous research which suggested that social alienation and depression are associated with poor outcome in cardiac patients, social inhibition and negative affectivity were therefore chosen as these personality traits may promote social alienation and depression (Denollet et al, 1996).

Type D personality is currently assessed using the DS14: Type D Personality Scale (Denollet, 2005). The scale consists of two sub-scales, one which measures negative affectivity, and one measuring social inhibition. In order to be classified as Type D, an individual must score highly (≥ 10) on both sub-scales. Accumulating evidence indicates that Type D can be considered a risk on par with established biomedical risk factors, with Type D patients experiencing a four-fold increased risk of adverse clinical outcome (Denollet et al, 1996; Denollet & Brutsaert, 1998; Denollet, Vaes & Brutsaert, 2000).

2.4.2.1 Type D Personality: More Than Just a Measure of Depression

Some critics have argued that Type D personality is nothing more than another measure of negative affect, labelling it as 'old wine in new bottles' (Lesperance & Frasure-Smith, 1996). However, the inclusion of the social inhibition component means that the Type D construct is more than a measure of negative affect or depression, as it also assesses how patients cope with this affect. Indeed, Denollet et al (2006) demonstrated, in a study of over 800 cardiac patients, that it was the interaction between high social inhibition and high negative affectivity, rather than

negative emotions alone which predicted death, MI, and repeat revascularization at 9-month follow-up. Furthermore, studies have demonstrated that Type D predicts adverse clinical outcome, even after controlling for measures of negative affect, such as anxiety and depression (Denollet & Brutsaert, 1998; Denollet, Vaes & Brutsaert, 2000). In addition, Denollet argues that Type D represents a normal personality construct, whereas, depression reflects psychopathology. Table 2.1 gives an overview of the studies published on Type D personality to date (adapted from Pedersen & Denollet, 2006).

2.4.2.2 Type D Personality and Psychological Distress

Type D personality is associated with increased psychological distress in CHD patients, including symptoms of depression and social alienation (Denollet et al, 1995; Schiffer et al, 2005), anger and anxiety (Denollet & Brutsaert, 1998) and pessimism (Denollet, 1998). In addition, in a study of almost 200 cardiac patients, Type D was associated with a six-fold increased risk of vital exhaustion at baseline and more than a four-fold risk at 6 weeks following treatment (Pedersen & Middel, 2001). Pedersen & Denollet (2004) also demonstrated that Type D individuals were at more than a fourfold risk of qualifying for a diagnosis of PTSD compared with non-Type D's.

2.4.2.3 Type D Personality and Cardiovascular Mortality and Morbidity

Type D personality has also been shown to have an adverse effect on mortality and morbidity across a number of patient groups (including patients with chronic heart failure, peripheral arterial disease, arrhythmia, sudden cardiac arrest, hypertension and heart transplantation recipients).

The first study to suggest that Type D personality has an adverse effect on health was conducted by Denollet et al (1995). They reported that the rate of death among patients following a Myocardial Infarction (MI) was significantly higher for those patients who were classified as Type D (39%) than those with other personality types (5%). These results were extended in a six-to-ten year follow-up study which revealed that CHD patients who were initially classified as Type D had a four-fold mortality risk compared with non-Type D patients (Denollet et al, 1996). In a 5-year prospective study in a new sample of over 300 patients with CHD, patients were classified as Type D or non-Type D. At follow-up, three factors emerged as significant predictors of cardiac death or nonfatal myocardial infarction, these were: left ventricle ejection fraction <50% (odds ratio = 3.9), age <55 years, (odds ratio=2.6) and Type D (odds ratio=8.9). Crucially, Type D remained a significant predictor even after controlling for medical variables (Denollet & Brutsaert, 1998). Type D personality was also associated with a 7-fold increased risk of developing cancer in a sample of 246 cardiac patients (Denollet, 1998). More recently, a 5-year follow-up study of over 300 CHD patients identified that those with a Type D personality had an increased risk of cardiac death (OR:4.8) and adverse cardiac event (OR: 2.9) at follow-up (Denollet et al, 2006).

It is also important to examine the role of Type D across other patient groups. Several studies have examined Type D in patients being treated with percutaneous coronary intervention (PCI; describes a range of procedures that treat narrowing or blockages in coronary arteries) or coronary artery bypass graft surgery (CABG). Pedersen et al (2004) in a sample of 875 PCI patients, found that Type D was an independent predictor of a composite of death and MI at nine months compared to non-Type D's,

5.6% versus 1.3% (OR=4.73). Further studies with PCI patients have found Type D to be associated with impaired health status (Pedersen et al, 2007a) and vital exhaustion (Pedersen et al, 2007b), and to predict the onset of depressive symptoms (Pedersen et al, 2006). In a study of patients undergoing CABG for multivessel disease, Type D was a predictor of both physical and mental quality of life one year after the procedure. Specifically, Type D patients were more than twice as likely to have poor physical quality of life, and more than five times as likely to have poor mental quality of life, after controlling for all other pre and postoperative variables (Al-Ruzzeh et al, 2005).

Results from other patient groups also point towards an important role for Type D. For example, Type D was a predictor of impaired quality of life, mood status and increased depressive symptoms in patients with chronic heart failure (Schiffer et al, 2005). In addition, Type D was also associated with poorer quality of life (and higher perceived stress) in patients with peripheral arterial disease (Aquarius et al, 2005). Furthermore, in patients with an implantable cardioveter defibrillator, symptoms of anxiety and depression were more prevalent in Type D patients compared to non-Type D patients (Pedersen et al, 2004) However, this is not surprising given that Type D is, in part, a measure of negative emotions. A study from Appels et al (2000), found that the prevalence of Type D personality is significantly higher in hypertensive patients (53%) compared to controls (20%) suggesting a role for Type D in hypertension (Denollet, 2005). More recently, evidence from heart transplantation recipients, indicates that Type D personality is associated with a three to six fold increased risk of impaired quality of life, even after controlling for demographic and clinical factors (Pedersen et al, 2006). Moreover, in a further study of heart transplant

recipients, Type D independently predicted mortality and acute rejection 5-years post-transplantation (Denollet et al, 2007).

Taken together, the findings from the studies described above (as outlined in Table 3.1), demonstrate that the Type D personality construct has important predictive utility across a wide range of CVD patient groups. These studies suggest that Type D personality is predictive of adverse clinical prognosis, increased distress and impaired quality of life. Importantly, the findings show that the impact of Type D personality on outcome remains significant even after controlling for disease characteristics, including disease severity. Given the accumulating evidence on Type D, it will be a key psychological factor within the thesis and will be utilised as a possible predictor of outcome post-MI in Chapter 8.

2.4.2.4 Criticisms of the Type D Personality Construct

Although the results described above on Type D are promising, it is important to acknowledge possible problems with the construct. First, the importance of negative emotions in heart disease is widely recognised, therefore it may be that the Type D construct is merely adding a further concept to a field which is already congested with related terms (e.g. anger and hostility, vital exhaustion, depressive symptoms). Indeed, the Type D construct has been criticised by Lesperance and Frasure-Smith (1996) as representing 'old wine in new bottles', highlighting the possibility that the Type D construct may not tell us anything new about risk factors for CHD. Second, as Type D personality is considered to be a stable trait, it may be difficult to develop successful treatments based on this concept. The overall aim of any Type D based intervention would be to reduce patients' risk of ill-health, however, personality features are

difficult to change with affordable and rapid treatment. Third, at present it is unclear if Type D is an aetiological risk factor for the development of CHD. At the moment all Type D research has been carried out with patients who have existing CHD, thus limiting Type D to be nothing more than a prognostic risk factor at present. It is therefore important for future research to be carried out to determine whether Type D is predictive of cardiac events in previously healthy individuals.

Table 2.1. Overview of Studies Published on Type D Personality (adapted from Pedersen & Denollet, 2006)

Authors	Participants	Study design	Follow-up	Main endpoint	Risk*
Denollet et al. (1996)	303 CHD patients	Prospective	6-10 yrs	All cause mortality	OR: 4.1
Denollet et al. (1998)	87 MI patients	Prospective	6-10 yrs	Cardiac death, non-fatal MI	RR: 4.7
Denollet (1998)	246 CHD patients	Prospective	6-10 yrs	Cancer	OR: 7.2
Denollet et al. (2000)	319 CHD patients	Prospective	5 yrs	Cardiac death, non-fatal MI	OR: 8.9
Pedersen et al. (2001)	171 CHD patients	Intervention study	6 weeks	Symptoms of exhaustion	OR: 4.7-6.4
Pedersen et al. (2004)	112 first MI patients, 115 healthy controls	Case-control	-	PTSD	OR: 4.5
Denollet et al (2006)	337 CHD patients	Prospective	5 years	Cardiac death	OR: 4.8
Pedersen et al. (2004)	875 PCI patients	Prospective	9 months	Composite of death and MI	OR: 4.5
Denollet et al. (2006)	875 PCI patients	Prospective	9 months	Major adverse cardiac event	HR: 1.92
Pedersen et al. (2006)	542 PCI patients without depression	Prospective	6 months	Depression	OR: 3.0
Pedersen et al. (2007a)	692 PCI patients	Prospective	12 months	Health status	OR: 4.0
Pedersen et al (2007b)	419 PCI patients	Prospective	12 months	Symptoms of exhaustion	OR: 3.5
Al-Ruzzeh et al. (2005)	437 CABG	Cross-sectional	-	Quality of Life	OR: 2.3-5.5
Schiffer et al. (2005)	84 CHF patients	Cross-sectional	-	Quality of life, depression	OR: 3.3-7.1
Aquarius et	150 PAD	Case-control	-	Perceived stress,	OR: 6.5-

al. (2005)	patients, 150 healthy controls			quality of life	7.4
Pedersen et al. (2004)	182 CHD patients, 144 partners	Cross-sectional	-	Anxiety, depression	OR: 4.4-8.7
Appels et al. (2000)	99 SCA patients, 119 CHD patients	Case-control	-	Sudden cardiac arrest	OR: 9.4
Denollet (2005)	2508 general population, 573 CHD patients, 732 hypertensives	Cross-sectional	-	Hypertension	OR: 5.5
Pedersen et al. (2006)	186 heart transplantation patients	Cross-sectional	-	Quality of life	OR: 3.6-6.1
Denollet et al. (2007)	51 heart transplantation patients	Prospective	5 years	Mortality, acute rejection	OR: 6.7

* Risk associated with Type D personality (adjusted analyses)
CABG = coronary artery bypass graft surgery; CHD = coronary heart disease; CHF = chronic heart failure; HR = hazard ratio; ICD = implantable cardioveter defibrillator; MI = myocardial infarction; OR = odds ration; PAD = peripheral arterial disease; PCI = percutaneous coronary intervention; RR = relative risk; SCA = sudden cardiac arrest

Research investigating possible mechanisms to explain the link between Type D personality and adverse prognosis is very much in its infancy. Therefore, a further aim of this thesis is to identify mechanisms which may help to explain the link between Type D and poor prognosis. The studies described in Chapters 5-7 aimed to test potential psychosocial and psychophysiological mechanisms linking Type D and ill-health.

Chapter 3: Theoretical Model

3.1 Theoretical Models in Health Psychology

The development of theoretical models to explain why people engage in health and illness behaviours has been a key priority for health psychology. It has been recognised for a number of years that patients' beliefs and cognitions about their health and illness affect both their responses to symptoms and their decisions about treatment. A number of models of health behaviour have been proposed to explain the ways in which individuals attempt to make sense of the problems that arise following illness onset or in response to symptoms. Much of this work has focussed on social-cognitive approaches. For example, the theory of planned behaviour (Ajzen, 1985; Ajzen & Madden, 1986; Ajzen, 1988) and self-regulatory frameworks, such as, Carver and Scheier's self-regulation model (Carver & Scheier (1998) and Leventhal's common sense model (Leventhal et al, 1980). These models have been used to try to understand the health-related behaviour of MI patients, including medication adherence, attendance at cardiac rehabilitation and predicting pre-hospital delay.

3.1.1 The Health Belief Model

As shown in Figure 3.1 the Health Belief Model (HBM) is a model that attempts to explain and predict health behaviours by focusing on the attitudes and beliefs of the individual. The HBM was developed in the 1950s as part of an effort by psychologists in the United States Public Health Service to explain the lack of public participation in health screening and prevention programmes. Since then, the HBM has been adapted to explore a variety of long and short-term health behaviours, including sexual risk behaviours and the transmission of HIV/AIDS.
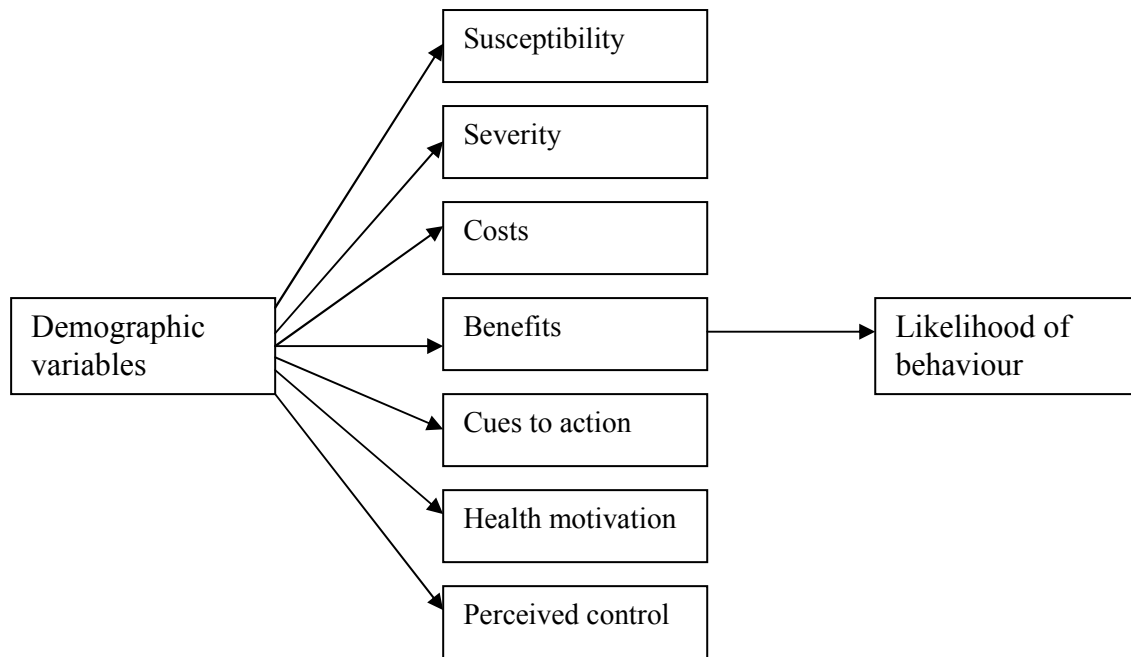
Figure 3.1 Basics of the Health Belief Model

Initially developed by Rosenstock (1966), and developed further by Becker and colleagues (e.g. Becker, Radius & Rosenstock, 1978), the Health Belief Model (HBM) has been utilised extensively to predict health behaviours. Specifically, it has been used in relation to the behaviour of MI patients, particularly in relation to adherence (Becker, Drachman & Kirscht, 1972). The HBM predicts that behaviour is a result of certain core beliefs. For example, in the case of adherence to medication in MI patients, the decision would be made based on two variables:

1) The amount of threat perceived by the patient in relation to the symptoms. This will determine how vulnerable s/he feels to cardiac disease and general illness, and is confirmed by the presence of symptoms, previous experience of symptoms, degree of disruption to social roles etc.

2) The attractiveness or value of the action in question, i.e. taking medication. This is based on the probability that, in the patients' view, the decision to take medication

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will reduce the threat and will not be too costly in terms of time, money or emotional energy.

The HBM was defined in terms of four constructs representing perceived threat and net benefits: perceived *susceptibility* (one's subjective perception of the risk of contracting a health condition), perceived *severity* (feelings concerning the seriousness of contracting an illness or of leaving it untreated, including evaluations of both medical and clinical consequences and possible social consequences), perceived *benefits* (the believed effectiveness of strategies designed to reduce the threat of illness)*,* and perceived *barriers* (the potential negative consequences that may result from taking particular health actions, including physical, psychological, and financial demands)*.* These concepts were proposed as accounting for people's 'readiness to act.' An added concept, *cues to action,* would activate that readiness and stimulate overt behaviour. A more recent addition to the HBM is the concept of *self-efficacy,* or one's confidence in the ability to successfully perform an action. This concept was added to help the HBM better fit the challenges of changing habitual unhealthy behaviours.

Although the HBM has met with some success in explaining behaviours such as having vaccinations, attending screening, and adherence (e.g. Harrison, Mullen & Green, 1992; McClenahan et al, 2007; Turner et al, 2007), it may not be the best model to use when predicting the behaviour of MI patients. First, the model seems to be more accurate at describing preventative health behaviours compared to behaviours that may need to be initiated once an illness has occurred, e.g. medication adherence (Haynes, 1976). Second, it emphasises the individual without taking into

consideration the role of others in the patients' adherence decisions. Third, there is an absence of a role for emotional factors, it is known that emotional factors are important in determining a patients' perception of their symptoms and subsequent action (Bunde & Martin, 2006).

3.1.2 The Theory of Planned Behaviour

The theory of planned behaviour (TPB; Ajzen, 1985) has also been used to predict the behaviour of MI patients. It was developed from the earlier, theory of reasoned action (Ajzen & Fishbein, 1980). As demonstrated in Figure 3.2, TPB suggests that a person's behaviour is determined by his/her intention to perform the behaviour and that this intention is, in turn, a function of his/her attitude toward the behaviour and his/her subjective norm. The best predictor of behaviour is intention. Intention is the cognitive representation of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour. This intention is determined by three things: their attitude toward the specific behaviour, their subjective norms and their perceived behavioural control. The TPB holds that only specific attitudes toward the behaviour in question can be expected to predict that behaviour. In addition to measuring attitudes toward the behaviour, the model proposes that it is also important to measure people's subjective norms – their beliefs about how people they care about will view the behaviour in question. To predict someone's intentions, knowing these beliefs can be as important as knowing the person's attitudes. Finally, perceived behavioural control influences intentions. Perceived behavioural control refers to people's perceptions of their ability to perform a given behaviour. These predictors lead to intention.
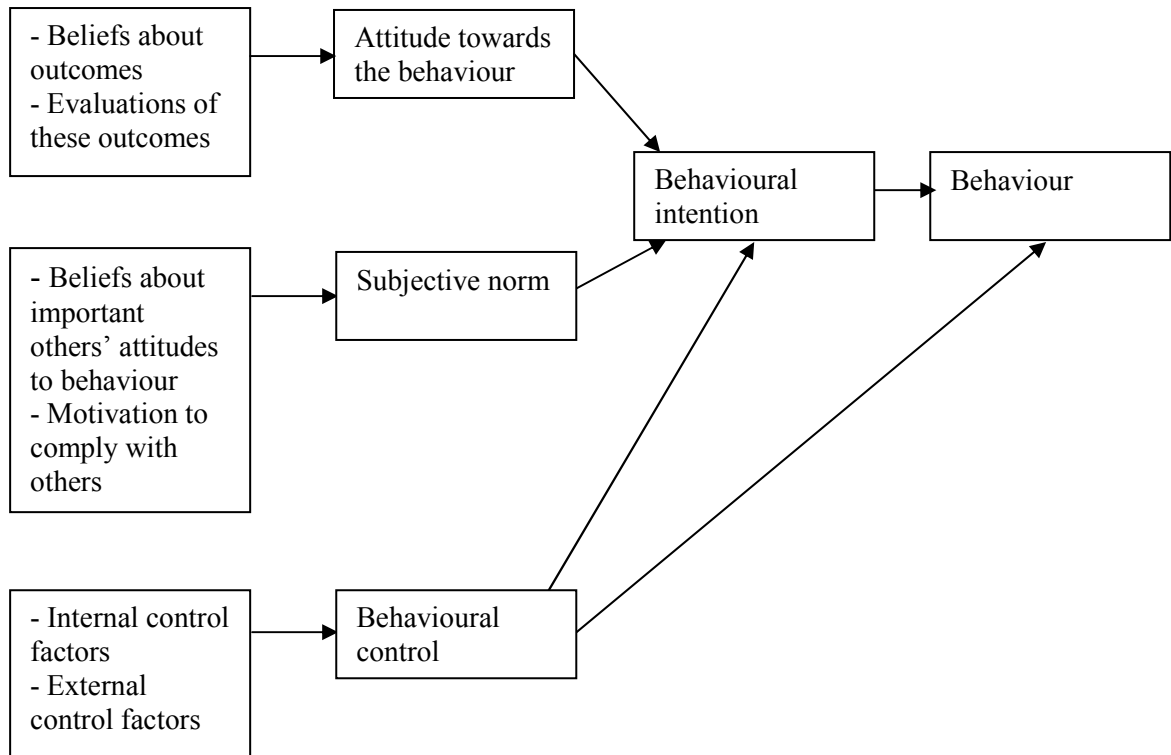
Figure 3.2 Basics of the Theory of Planned Behaviour

The TPB therefore suggests that behavioural intentions are the result of three factors:

1) Attitude towards a behaviour, which is a judgement of whether or not the behaviour is a good thing to do and comprises both positive and negative evaluations of the behaviour and possible outcome.

2) Subjective norm, reflecting the impact of social pressure or influence on the behaviours acceptability and appropriateness

3) Perceived behavioural control, which is the belief that the individual can carry out a particular behaviour, based on internal and external control factors.

The theory has met with some success across a wide range of behaviours (Armitage & Conner, 2001; Conner & Sparks, 1996) such as exercise (Hausenblas, Carron & Mack,

1997) and condom use (Sheeran, Abraham & Orbell, 1999). In addition, Johnston et al (2004) tested if the intention and perceived behavioural control components of TPB would predict behavioural risk factors one year post-MI. They found that only the perceived behavioural control component, and not intention, predicted behaviour (exercise, distance walked, and smoking cessation). The TPB has been criticised on the basis that intentions and behaviour are only moderately correlated, therefore people do not always perform the behaviour that they intend to. Indeed, although some people may develop an intention to change their health behaviour, they might not take any action. This discrepancy has been labelled the 'intention-behaviour gap' (Sheeran, 2002). In addition, the TPB fails to take into account the role of past behaviour, which is often the best predictor of future behaviour (e.g. Mullen et al, 1987).

3.2 Self-Regulation Models

In recent years there has been an increased interest in self-regulation within health psychology. All models of self-regulation describe self-regulation as a 'systematic process involving conscious efforts to modulate thoughts, emotions, and behaviours in order to achieve goals within a changing environment' (Cameron & Leventhal, 2003). It is a 'dynamic motivational system of setting goals, developing and enacting strategies to achieve those goals, appraising progress, and revising goals and strategies' (Cameron & Leventhal, 2003). As such, feedback loops play a critical role in these models, wherein goals serve as a reference point for appraising the relative success of efforts.

There are two main models of self-regulation which have been applied to health and illness behaviour. They are Carver & Scheier's (1998) self-regulation model and Leventhal's Common-Sense Model (CSM; Leventhal et al, 1980). The CSM was developed primarily to explain health and illness behaviour, and focuses on schematic contents, whereas, Scheier and Carver's model was developed as a more general theory of behaviour. Both models are described in greater details in the subsequent sections.

3.2.1 Carver and Scheier's Self-Regulation Model

Carver and Scheier's model of self-regulation (1998) has been developed as a general theory of behaviour, which can be applied to health. The central idea in this model is that people live life by identifying goals and behaving in ways aimed at attaining these goals. The model posits that there is hierarchical organisation among goals. For example, a higher level goal may be to be healthy, whereas, a lower level goal may be going to the gym on a daily basis. The model also makes the distinction between approach goals, such as those described above, and avoidance goals (e.g. avoid visiting the doctor) (Elliot & Sheldon, 1997).

An individual will regulate their actions in relation to these goals through feedback loops which guide behaviour. A second feedback process is related to affect, it checks on how effectively the behaviour system is operating with regards to specific goals (Carver & Scheier, 1999). The result of this feedback process is thought to lead to feelings of confidence or doubt and a sense of positivity or negativity. These feedback processes will allow an individual to determine if the expectation of achieving their

goal is favourable or not, which will lead the individual to either renew their efforts or to disengage from the goal (see Figure 3.1; Carver & Scheier, 1998).
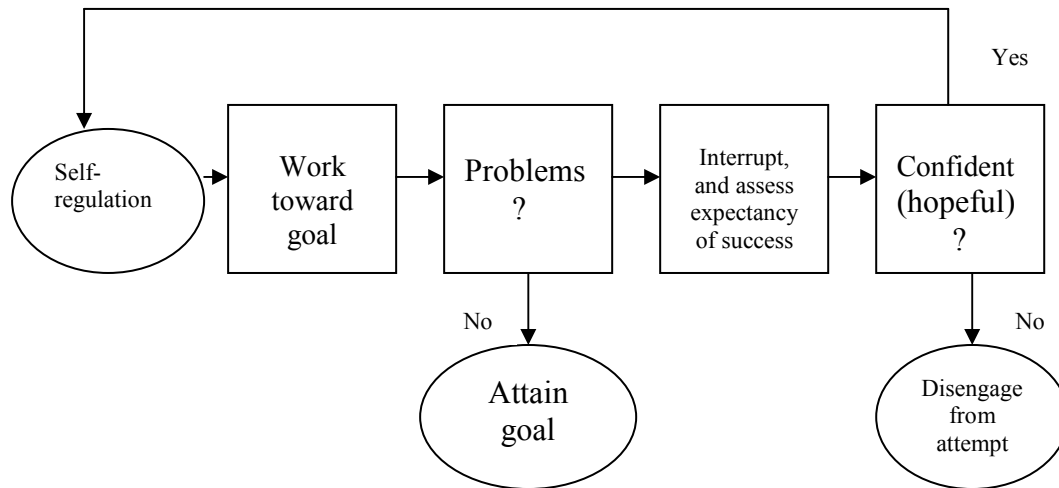
Figure 3.3 A flow-chart depiction of self-regulatory possibilities when obstacles to goal attainment are encountered (adapted from Carver and Scheier, 1981)

The model can be applied to health in a number of ways (Scheier & Carver, 2003). For example, illness episodes may undermine people's confidence in achieving their goals. Furthermore, the onset of illness would directly threaten the goal of being healthy. With regards to health-related behaviours, these can be viewed as lower-level goals which are required to meet the higher-order goal of maintaining health. Many of the studies which have used Carver & Scheier's model in the area of cardiac disease have focussed on the role of optimism on adjustment to heart disease and its treatment (see section 3.2.4). More recently, research has focussed on goal disengagement from unattainable goals (Rasmussen, Wrosch, Scheier & Carver, 2006). Findings suggest

that disengaging from unattainable goals should be adaptive because it removes the person from the negative emotional consequences of repeated failure. Indeed, abandoning unattainable goals has been found to preserve a person's subjective well-being (e.g. Heckhausen, Wrosch & Fleeson, 2001). The process of goal re-engagement, the ability to adopt a new goal, or to take a new path towards an existing goal, is also an important part of being goal-engaged.

3.2.2 Leventhal's Self-Regulation Model

The common sense model (CSM) is based on the idea that individuals are active problem solvers who make sense of a threat to their health, such as symptoms or illness diagnosis, by developing their own cognitive representation of the threat, which, in turn determines how they respond. The CSM covers three important stages (as shown in Figure 3.4). Stage 1 describes a process of interpretation, at this time patients have been confronted with a health threat either in the form of symptom perception (e.g. chest pain) or from social messages (e.g. receiving a diagnosis of angina). Early research by Leventhal and colleagues led to the development of the parallel processing approach (Leventhal, 1970) which suggested that both cognitive and emotional processing is activated in the presence of this health threat. In terms of emotional processing, the health threat will change the emotional state of the individual and often lead to feelings of fear, anxiety and depression. However, most research has focussed on the cognitive processing and the development of illness cognitions.
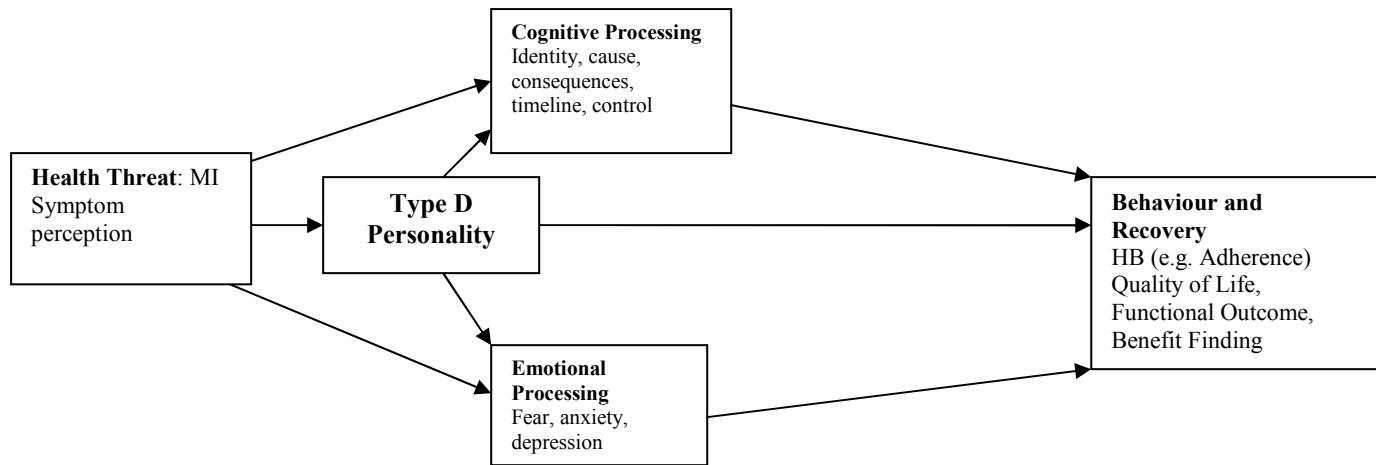
Figure 3.4: Adaptation of Leventhal's Common Sense Model to include Type D personality.

Illness cognitions stand for an individual's common-sense definition of health threats (Leventhal, Leventhal & Contrada, 1998). Evidence suggests that these representations consist of five components that serve to define the nature of the health threat for the individual. Allowing them to make sense of their symptoms, assess health risk and ways of coping with this risk. These illness representations are activated when a health threat becomes apparent, usually this occurs in the form of symptoms or a disease label when asymptomatic. The five main illness cognitions as identified by Leventhal are identity, cause, time-line, consequences and cure or control.

The identity component refers to the label given to the health threat (e.g. heart attack) and the symptoms experienced from it (e.g. chest pain, breathlessness). Linked to this is the individual's beliefs of the causes of their condition (e.g. stress) and their expectations about its time-line i.e. the time for the development of the disease, its duration, and time for recovery; the individual will also have beliefs relating to the consequences of the illness (e.g. time off work); and control, or the degree to which the disease can be cured or controlled. These five components will determine the way in which the patient copes with the health threat, for example it will impact on their health-related behaviour such as medication adherence (Petrie et al, 2002).

The next stage in the CSM is the development and identification of suitable coping strategies, generally this refers to the individual engaging either in approach coping (e.g. adhering to medication) or avoidance coping (e.g. denial). The third stage in the model involves individuals evaluating the success of their coping strategy and the reassessment of their cognitive representations.

3.2.2.1 The Common Sense Model and Recovery Following MI

It is known that patients' beliefs and perceptions of their illness are important during recovery from MI. For example, Byrne (1982) showed that MI patients who had more negative expectations about their illness and future work capacity were less likely to return to work and to have lower levels of functioning independent of the severity of their MI. 'Cardiac invalidism' refers to patients who adopt an extremely passive, dependent and helpless role believing that any form of vigorous activity will bring on another MI. Indeed, accumulating evidence suggests that psychological variables are

more important than medical ones in influencing recovery following MI (e.g. Diedricks et al, 1991; Garrity, 1973).

The CSM has therefore been applied to predict recovery from illness. More specifically, research in this area has primarily focussed on the utility of illness cognitions in predicting recovery following myocardial infarction (MI). For example, Petrie et al (1996) examined whether patients' perceptions of their MI assessed at the time of hospital admission predicted subsequent attendance at cardiac rehabilitation, return to work, disability, and sexual dysfunction at three and six months later. One hundred and forty three MI patients completed measures of illness perceptions, anxiety and distress, and sexual functioning. It was found that patients' illness perceptions were associated with attendance at rehabilitation programmes, speed of return to work, later sexual difficulty, and recovery of domestic and social functioning. Specifically, patients who believed that their illness was amenable to cure or control were more likely to attend cardiac rehabilitation. In addition, those who anticipated that their illness would have major consequences on their life were slower to return to work and regain social and domestic duties. Furthermore, patients' initial perception of illness identity was related to later sexual problems.

Further research carried out by Cooper et al (1999) also found that patients who had weaker beliefs in the control or cure of their heart condition were less likely to attend cardiac rehabilitation. The model has also been successful in explaining psychosocial adjustment in other cardiac groups, for example, Steed et al (1999) have utilised it successfully in patients with atrial fibrillation. In addition, Walsh et al (2004) successfully utilised the CSM to predict prehospital delay following an MI.

3.2.2.2 The Common Sense Model and Interventions with MI Patients

A further advantage of the CSM is that the psychological dimensions it describes are potentially modifiable and they afford the opportunity for intervention to reduce morbidity and mortality (Petrie et al, 2002). As a result, interventions have been developed to modify patients' cognitions and behaviour to enhance health outcomes. For example, Petrie et al (2002) showed that a brief psychological hospital-based intervention could change inaccurate and negative illness perceptions of MI, and in turn lead to an earlier return to work, less long term disability, and improved cardiac rehabilitation attendance.

The intervention consisted of an explanation concerning the pathophysiology of MI and an exploration of the patients' beliefs about the cause to their MI in order to address any misconceptions they have. Results at 3-month follow-up showed that the intervention caused significant positive changes in patients' views of their MI. Specifically, those in the intervention group had significantly modified their perceptions about how long their illness would last and the personal consequences of the MI on their life. In addition, the intervention group was more optimistic that their illness could be controlled or cured. Furthermore, at follow-up the intervention group reported fewer angina symptoms that the controls. Most importantly, the intervention group returned to work at a significantly faster rate than the control group at 3 months after MI.

The CSM will therefore be used as the guiding theoretical model for this thesis as it is a specific model of illness behaviour, which has been used successfully in the past in studies with MI patients. It represents a flexible model of behaviour in the event of an

MI and is specific enough to explain psychological outcome following MI, and specifically health-related behaviour, including adherence. In addition, to our knowledge this model has not been used to predict cardiac death or nonfatal myocardial infarction specifically. The CSM framework will be used to focus in particular on patients' beliefs about illness. For example, it is proposed that patient representations of cause will be important in predicting health-related behaviour such as adherence, an important outcome measure in this study.

The CSM will be operationalised in the following way. First, the health threat identified is an MI. Second, the cognitive processes being investigated are illness perceptions, locus of control, and medication beliefs. In addition personality factors (optimism and Type D) are investigated to determine their role with a self-regulatory framework. Furthermore, the role of prospective thinking and role and goal investment will be examined within the model as these psychological factors have been shown to important cognitive pathogens in other health contexts. Third, the outcome variables will include health behaviours, focussing on medication adherence, as these behaviours are known to be strongly influenced by illness and medication cognitions. In addition, adjustment will be assessed through measures of quality of life, functional outcome and benefit finding. The thesis will also examine to what extent personality (as assessed by Type D), fits within self-regulatory theory to enhance our understanding of patient recovery.

In summary, this thesis will use Leventhal's CSM as a theoretical framework for several key reasons. First, it was selected as it applies more specifically to health and illness behaviour in comparison to other more general models of self-regulation.

Second, as the model applied specifically to health it can capture critical aspects of health and illness such as the complexities surrounding medication use which is a key aim of the current thesis. Third, previous research on cardiac disease has found that patients' personal models of illness are important in predicting recovery after MI (e.g. Byrne, 1982; Maeland & Havik, 1987). Fourth, previous studies have found Leventhal's CSM to be especially useful in examining health behaviour in cardiac patients and to be successful in predicting psychosocial adjustment to cardiac disease (Cooper et al, 1999; Petrie et al, 2002; 1996; Steed et al, 1999).

Chapter 4: Methodology

4.0 Overview

This chapter describes the assessment tools that were used in each of the five studies. A synopsis of each measure will be given, in order to avoid unnecessary repetition of the description of measures in each chapter as there is some overlap in the measures utilised in each study. Instead, the methodology section of each study will give only a brief description of the measures used. The measures are divided into two categories: (i) predictor variables, and (ii) outcome variables. Table 4.1 shows the measures used in each study. In addition, Table 4.2 and 4.3 outlines each of the predictor and outcome measures used.

Table 4.1 Summary of the measures used for each study

	Measures (Time 1)	Measures (Time 2, if applicable)
Study 1 (Chapter 5)	Type D Personality (DS14) Health Behaviour (GPHB) Social Support (SNSS) Neuroticism (EPQR-S)	
Study 2 (Chapter 6)	Type D Personality (DS14) Health Behaviour (GPHB) Social Support (SNSS) Neuroticism (EPQR-S)	Type D Personality (DS14) Health Behaviour (GPHB) Social Support (SNSS) Neuroticism (EPQR-S)
Study 3 (Chapter 6)	Type D Personality (DS14) Health Behaviour (GPHB) Health Behaviour (Weinman) Health Behaviour (Ogden) Social Support (SNSS) Social Support (MOS-SSS) Neuroticism (EPQR-S)	
Study 4 (Chapter 7)	Type D Personality (DS14) Health Behaviour (GPHB) Social Support (SNSS) Neuroticism (EPQR-S) Stress Arousal Checklist (SAC)	
Study 5 (Chapter 8)	Type D Personality (DS14) Health Behaviour (GPHB) Future Thinking (FTT) Optimism (LOT-R) Depression (HADS) Anxiety (HADS) Locus of Control (RLOC) Beliefs about Medicines (BMQ) Illness Perceptions (BIPQ) Delay	Type D Personality (DS14) Health Behaviour (GPHB) Depression (HADS) Anxiety (HADS) Beliefs about Medicines (BMQ) Medication Adherence (MARS) Roles and Goals (RAG) Benefit Finding (BF) Quality of Life (MACNEW) Functional Outcome (FLP)

4.1 Predictor Variables

4.1.1 Type D Personality

The Type D Personality Scale (DS14; Denollet, 2005) is a 14-item scale comprising of 2 subscales (see Appendix 1). A 7-item subscale which measures negative affectivity (NA: items 2, 4, 5, 7, 9, 12) and a 7-item subscale measuring social inhibition (SI: items 1, 3, 6, 8, 10, 11, 14). Examples of items measuring negative

affectivity are 'I often feel unhappy', and 'I am often down in the dumps'. Examples for the social inhibition subscale are 'I often feel inhibited in social interactions' and 'I find it hard to start a conversation'. Respondents rate their personality on a 5-point Likert type scale which ranges from 0=false to 4=true (items 1 and 3 were reverse scored). The NA and SI scales can be scored as continuous variables (range 0-28) to assess these personality traits independently. Participants who score highly on both NA and SI using a cut-off point of ≥ 10 on both scales are classified as having a Type D personality. Recently, Emons, Meijer and Denollet (2007) demonstrated the reliability of this cutoff using item response theory. In addition, they found the measurement of NA, SI, and Type D to be comparable across both general and clinical populations. Test-retest correlations are 0.82 and 0.72 for the social inhibition and negative affectivity scales respectively, indicating that Type D is stable across time. In addition, it has high internal validity with Cronbach's α of 0.88 and 0.86 for the negative affectivity and social inhibition subscales respectively (Denollet, 2005). It has also been shown that the assessment of Type D personality is not dependent on mood or health state (Denollet, 2005).

4.1.2 Social Support

4.1.2.1 Quality of Social Network and Social Support Scale

Social support was measured using a shortened version of the Quality of Social Network and Social Support Questionnaire (see Appendix 2, SNSS; Dalgard, Bjork & Tambs, 1995). It was chosen in order to determine the quality of social support being received, as opposed to the quantity of social support available, which is often assessed by other social support scales. Although there are a number of scales for assessing social support, we chose the SNSS because it was devised for use with

general population, non-clinical samples, and it is a brief instrument. The original form of the SNSS contains 3 subscales relating to social support received from family, friends and neighbours. For the purpose of the current studies, the neighbours network was omitted as it was not thought to be relevant for a student population, thereby yielding a 9 item scale relating to quality of social support received from friends and family e.g. 'Do you feel that you can count on your friends in the future?' These can either be scored as two continuous variables or combined to give one single score for the total network. Response categories vary by question, with participants being asked to indicate their strength of agreement with each item. There is no published reliability or validity data for the scale.

4.1.2.2 Medical Outcomes Study: Social Support Survey

The Medical Outcomes Study: Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991) was originally developed for patients in the Medical Outcomes Study (see Appendix 3), a two-year study of patients with chronic conditions. It is an 18-item measure which assesses four separate social support subscales. Firstly, emotional/ informational support, an example of an item representing informational support is 'Someone to give you good advice about a crisis. The next subscale is tangible support including the item 'Someone to help you if you were confined to bed'. A further subscale is affectionate support, for example 'Someone who shows you love and affection' and finally the positive social interaction subscale including the item 'Someone to have a good time with' and an additional item, 'Someone to do things with to help you get your mind off things'. Respondents are asked to indicate how often each of the different kinds of support is available to them, ranging from 'none of the time' to 'all of the time' Scores on each subscale can be combined to

give an overall social support index. A higher score for an individual scale or for the overall support index indicates more support. The scale has exhibited good internal consistency for each sub-scale (all Alphas >0.91) and good test-retest reliability at 12 months (r=0.7) (Hays, Sherbourne & Mazel, 1992).

4.1.3 Neuroticism

This dimension was measured by using the 12-item short version of the neuroticism subscale of the revised Eysenck Personality Questionnaire (EPQR-S; Eysenck, Eysenck & Barrett, 1985) (Appendix 4). This scale was primarily selected for its brevity, and because it is the scale most often used to assess neuroticism. Participants are required to make yes/no decisions in response to each item e.g. 'Are your feelings easily hurt?' The number of 'yes' responses are then summed to give a total score for neuroticism, with higher scores indicating higher levels of neuroticism. Eysenck and Eysenck (1991) demonstrated that the scale has excellent reliability (α=0.88) and validity.

4.1.4 Future Thinking

The future thinking task (FTT; MacLeod et al, 1997) was used to assess prospective thinking (see Appendix 5). It requires participants to generate potential future experiences (both positive and negative) across three time periods in the future; the next week, the next year and the next five to ten years. For positive future thoughts participants are told 'I'd like you to try to think of things that you are looking forward to, things that you enjoy'. For negative future thoughts the instruction 'I'd like you to think of things that you're worried about or not looking forward to' is given. Order of completion of positive and negative conditions is counterbalanced across participants

so that half of participants are required to think of negative future thoughts first and half are required to think of future positive thoughts first. The order of presentation of time periods is constant (week, year, 5-10 years). For each of these time periods the participant is given one minute to generate as many thoughts as possible. Participants are told that their responses can be trivial or important, whatever comes to mind. They are also told that the responses should be things that they think will definitely happen or are at least quite likely to happen. Finally, they are told to keep trying until the time limit is up. Before administration of the FTT, all participants complete the standard verbal fluency task (Lezak, 1976) to assess general cognitive fluency. This task requires participants to generate as many words as possible beginning with the three letters (F, A, S) with one minute allowed for each letter.

4.1.5 Optimism

Optimism/ Pessimism was assessed by the Life Orientation Task-Revised (LOT-R; Scheier, Carver & Bridges, 1994) (Appendix 6). This is a 10-item scale including three positively worded items (e.g. I'm always optimistic about my future'), three negatively worded items (e.g. If something can go wrong for me it will'), and four filler items (e.g. It's easy for me to relax). Participants are asked to indicate their agreement with these statements on a 5-point scale ranging from 'I agree a lot' to 'I disagree a lot'. The scores from the positively and negatively worded items (reverse scored) are summed to give an overall score for optimism/pessimism with higher scores representing higher levels of dispositional optimism. The test has been shown to exhibit good internal consistency (α=0.78) and reliability (Scheier, Carver & Bridges, 1994).

4.1.6 Locus of Control

The Recovery Locus of Control Scale (RLOC; Partridge & Johnson, 1989) is a 9-item scale developed to measure the internality/externality of an individual's perceptions of control over their recovery (see Appendix 7). Five items reflect internal beliefs, for example 'How I manage in the future depends on me, not on what other people can do for me', and four items are worded to reflect external beliefs, for example 'My own efforts are not very important, my recovery really depends on others'. Participants are asked to indicate their level of agreement with each item using a five-point Likert-type scale from 1 ('strongly agree') to 5 ('strongly disagree'). The scores from the items are summed (the external items are reverse scored) so that high scores represent high internal beliefs, representing a strong internal locus of control. The RLOC has been shown to exhibit good predictive and content validity (Partridge & Johnson, 1989). In addition, the internal consistency was found to be good-moderate for both the internal ($\alpha=0.62$) and external items ($\alpha=0.65$) (Partridge & Johnson, 1989).

4.1.7 Beliefs about Medicines

The Beliefs about Medicines Questionnaire (BMQ; Horne, Weinman & Hankins, 1999) assesses cognitive representations of medication (see Appendix 8). The BMQ comprises two sections. These are the BMQ-Specific which assesses representations of medication prescribed for personal use and the BMQ-General which assesses beliefs about medicines in general. The BMQ-Specific comprises two scales, one 5-item scale which assesses personal beliefs about the necessity of prescribed medication for controlling their illness (e.g. 'My health, at present, depends on my medicines') and another 5-item scale which assesses concerns about the potential adverse effects of taking the medication (e.g. 'I sometimes worry about the long-term

effects of my medicines.'). The BMQ-General also comprises two scales, consisting of 4-items each. The general-overuse scale assesses views about the way in which medicines are used by doctors and assesses personal beliefs about the extent to which doctors place too much trust in medicines (e.g. 'Doctors use too many medicines'). The general-harm scale assesses beliefs about the intrinsic properties of medicines and the degree to which they are perceived by the individual as being harmful (e.g. 'All medicines are poisonous'). Respondents indicate their level of agreement with each statement on a 5-point Likert-type scale, ranging from 1=strongly disagree to 5=strongly agree. Scores obtained for the individual items within each scale are summed to give a scale score with higher scores indicating stronger beliefs in the concepts represented by the scale. Internal consistency for the scale is good, with values ranging from 0.65-0.86, in addition the test-retest reliability of the BMQ was satisfactory for a 2 week period (Horne, Weinman & Hankins, 1999).

4.1.8 Illness Perceptions

The Brief Illness Perception Questionnaire (Brief IPQ; Broadbent et al, 2006) is a 9-item scale designed to quickly assess the cognitive and emotional representations of illness (see Appendix 9). Five of the items assess cognitive illness representations: consequences ('How much does your illness affect your life'), timeline ('How long do you think your illness will continue'), personal control ('How much control do you feel you have over your illness'), treatment control ('How much do you think your treatment can help your illness'), and identity (How much do you experience symptoms from your illness'). Two of the items assess emotional representations: concern ('How concerned are you about your illness') and emotions ('How much does your illness affect you emotionally'). One item assesses illness

comprehensibility ('How well do you feel you understand your illness'). All of these items are rated using a 0-10 response scale. The final item assesses causal representation of the illness by an open-ended response item which asks patients to list the three most important causal factors in their illness. The items have good test-retest reliability (average $\alpha=0.7$) at 3 and 6 weeks and good predictive validity in patients recovering from MI (Broadbent et al, 2006).

4.1.9 Roles and Goals

The Roles and Goals Questionnaire (RAG; Lam & Power, 1991) assesses an individual's roles and goals across four domains (see Appendix 10). (1) present work; (2) the most important interests and hobbies; (3) the most important personal relationships; and (4) health and independent living. For domain (1) the respondent was asked to specify his/her current employment (if applicable), for domain (2), the nature of the hobby or interest, for domain (3), the individual whom the respondent considers to be the most important relationship, and in domain (4), the name of any illness affecting them. In addition, if there was an important role of goal not covered by the above four domains, an extra section was provided for the participant to specify what the role of goal was. For each domain the participants are asked a series of five questions, and asked to rate their responses on a four-point scale: 1=very little, 2=moderate amount, 3=quite a lot, and 4=a great deal. For each domain the questions assess 'How much does this [enter domain] make you feel good as a person', 'How much energy and effort do you put into this [enter domain]', 'How successful will you be in this [enter domain]', 'To what extent does being successful in other areas of your life depend on your being successful at [enter domain]' and finally 'To what extent would life feel meaningless or unhappy without it'. A score for each domain

can be computed as well as an overall RAG score. The RAG has been shown to exhibit good stability across time with a test-retest correlation of 0.79 at 3 months. Furthermore, the scale exhibits good internal consistency at 0.85 (Lam & Power, 1991).

4.1.10 Stress Arousal

Stress arousal was assessed by the Stress Arousal Checklist (SACL; Mackay et al, 1978) (Appendix 11). The SACL contains 30 items which are one-word positive and negative adjectives commonly used to describe psychological stress. For the purposes of the study described in Chapter 7 the 15 items used to measure arousal were eliminated, leaving a 19 item measure of stress (e.g. tense, worried). Respondents are asked to read the words and rate how strongly they feel at that moment on a 4-point scale ranging from 'definitely feel' to 'definitely do not feel'. When scoring the scale if 'definitely feel' or 'slightly feel' are selected for a positive adjective then a score of 1 is given, if 'cannot decide' or 'definitely not' are selected for a negative then a score of 1 is given for that item. Otherwise a score of 0 is given. This gives respondents a score between 0-19 on the stress index, higher scores represent higher subjective feeling of stress. There are no published reports on the reliability of the SACL. However, it has been subjected to factor analysis by several researchers to determine its internal consistency. Studies by Mackay et al (1978), and Fischer and Donatelli (1987) both yielded a two-factor structure, subsequently labelled stress and arousal. In addition, the SACL has been shown to have concurrent validity, with scores correlating with various physiological measures (Mackay, 1980).

Table 4.2 Summary table for the measures for each predictor variable

Construct	Name of Measure	Authors	Year	Number of Items	Rating Scale
Type D Personality	Type D Personality Scale (DS14)	Denollet	2005	14	5-point scale ranging from 0=False to 4=True
Social Support	Quality of Social Network and Social Support Scale (SNSS)	Dalgard, Bjork & Tambs	1995	9	3 or 4-point scale
Social Support	The Medical Outcomes Study: Social Support Survey (MOS)	Sherbourne & Stewart	1991	19	5-point scale ranging from 1=None of the time to 5=All of the time
Neuroticism	Eysenck Personality Questionnaire (EPQR-S)	Eysenck, Eysenck & Barrett	1985	12	Yes or No
Future Thinking	The Future Thinking Task (FTT)	MacLeod, Pankhania, Lee & Mitchell	1997	6	Number of responses generated
Optimism	Life Orientation Task-Revised (LOT-R)	Scheier, Carver & Bridges	1994	10	5-point scale ranging from 'I agree a lot' to 'I disagree a lot'
Locus Of Control	The Recovery Locus of Control Scale (RLOC)	Partridge & Johnston	1989	9	5-point scale ranging from 'strongly agree' to 'strongly disagree'
Beliefs about Medicines	Beliefs about Medicines Questionnaire (BMQ)	Horne, Weinman & Hankins	1999	18	5-point scale ranging from 'strongly disagree' to 'strongly agree'
Illness Perceptions	The Brief Illness Perceptions Questionnaire (Brief IPQ)	Broadbent, Petrie, Main & Weinman	2006	10	0 to 10 response scale
Roles and Goals	The Roles and Goals Questionnaire (RAG)	Lam & Power	1991	20	4-point scale ranging from 'very little' to 'a great deal'
Stress Arousal	Stress Arousal Checklist	Mackay, Cox, Burrows & Lazzarini	1978	19	4-point scale ranging from 'definitely feel' to 'definitely do not feel'

4.2 Outcome Variables

4.2.1 Depression and Anxiety

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item self-report measure designed to assess depression and anxiety (see Appendix 12). It contains two subscales, one 7-item scale relating to depression (items 2, 4, 6, 8, 10, 12, 14), for example 'I feel as if I am lacking in energy', and one 7-item subscale relating to anxiety (items 1, 3, 5, 7, 9, 11, 13), for example 'I feel tense or wound up'. Items are rated on a 0-3 point scale indicating strength of agreement with each item. The maximum score for each subscale is 21, with higher scores representing higher levels of depression or anxiety. With regards to the psychometric properties of the HADS, a review by Bjelland, Dahl, Haug & Neckelmann (2002) of 747 studies using the HADS found it to be both reliable and valid for use with the general public and in a health setting, with α= 0.83 and 0.82 for the anxiety and depression scales respectively.

4.2.2 Health Behaviour

4.2.2.1 General Preventive Health Behaviours Checklist

The General Preventive Health Behaviours Checklist (GPHB; Amir, 1987) (Appendix 13) consists of 29-items selected 'to represent a broad sample of possible preventive health behaviours thought to be relevant to a British population' (Amir, 1987). This scale was selected as it is recommended in Wright, Johnston & Weinman's (1995) 'Measures in Health Psychology Portfolio' and has been used successfully in the past in a young healthy population (Ingledew & Brunning, 1999), although it was originally used with an elderly population. Items were chosen from Harris and Guten's (1979) list, for example 'keep a first-aid kit in the house' and to reflect the

predictive items from the Alameda County Study, for example 'regularly eat breakfast'. Three response categories are offered for each item; 'always or almost always', 'sometimes' and 'do not do'. When scoring the scale, only the response 'always or almost always' is scored and in each case, the score is 1, the other responses are scored as zero. This scoring system is used to reduce the effects of social desirability response bias which might lead respondents to say 'sometimes' rather than 'no'. This gives a GPHB index from 0 to 29, with higher scores reflecting more health behaviours being performed. There is no published evidence of the reliability and validity of the scale.

4.2.2.2 General Preventive Health Behaviours Checklist- Brief

A brief version of the GPHB was also developed (see Appendix 14); this was done in order to reduce time taken to complete the scale. The Brief GPHB is an 8-item measure. These items were selected as being the eight preventive health behaviours on which groups of respondents who were found to be in 'very good', 'good' and 'average to very poor' health following medical assessment significantly differed (Amir, 1987). These items were 'eat sensibly', 'avoid crossing the street against the lights', 'get enough sleep', 'spend time out of doors everyday', 'do not smoke', 'get enough exercise', 'avoid letting things get me down' and 'get a regular medical check-up'. The original scoring system from the GPHB was used. There is no reliability data available for this scale as this is the first time the abbreviated scale has been used.

4.2.2.3 Health Behaviour Scale- Weinman, Petrie, Sharpe & Walker

The Health Behaviour Scale has been used once previously in Weinman, Petrie, Sharpe & Walker's (2000) study which examined causal attributions in first-time MI patients, and is designed to assess health behaviour over an average week (see Appendix 15). It is an 11-item self-report scale reflecting a range of health behaviours. Items 1-8 ask participants to rate how often they performed a number of health behaviours (e.g. physical exercise, 7-8 hours sleep). Responses are made on a 6-point scale: 'never', 'once a month', 'once a week', '2-3 times a week', '4-5 times per week', and 'everyday'. The remaining questions ask participants how many minutes they spend exercising in an average week, if they use fat-reduced milk, and whether they use butter or margarine as a choice of spread. There is no reliability or validity data available for this scale, and to my knowledge the scale has not been utilised elsewhere.

4.2.2.4 Health Related Behaviours Scale – Ogden & Mtandabari

The health related behaviours scale was developed by Ogden & Mtandabari (1997) in their study of examination stress and changes in mood and health related behaviours in students (see Appendix 16). To my knowledge the scale has not been utilised elsewhere. Participants are required to complete questions about five health related behaviours; smoking, alcohol consumption, eating behaviour, exercise, and sleep. For example, for smoking behaviour, participants were asked (a) 'Do you ever smoke' (Yes / No); (b) 'Over the last week, on average how many cigarettes have you smoked', and (c) 'Over the last week, how much have you been craving cigarettes'. Questions followed a similar format for each of the behaviours. To our knowledge there is no reliability or validity data available for this scale.

4.2.3 Benefit Finding

Benefit finding was measured using a 17-item measure developed by Urcuyo, Boyers, Carver & Antoni (2005) (Appendix 17). The measure used the stem 'Having had a heart attack…..' which was adapted from the original stem of 'Having had breast cancer', and each item continued by mentioning a potential positive contribution to the respondent's life that might plausibly follow from their experience of having a heart attack, for example 'Having had a heart attack has brought my family closer together'. Respondents rate their level of agreement with each item on a 4-point scale ranging from 'I disagree a lot' (0) to 'I agree a lot' (3) with higher scores indicating higher levels of benefit finding. The scale has been widely used in studies of benefit finding and internal consistency for the measure has been found to be good (α=0.91).

4.2.4 Quality of Life

Quality of life after myocardial infarction was assessed using the MacNew (Lim et al, 1993; Valenti et al, 1996) (Appendix 18). This is a heart disease specific health-related quality of life HRQL) instrument which assesses three major HRQL domains; emotional (e.g. 'In general, how much of the time during the last 2 weeks have you felt frustrated, impatient or angry', physical (e.g. 'How much shortness of breath have you experienced during the last 2 weeks while doing your day-to-day activities', and social (e.g. 'How often during the last 2 weeks have you felt you were unable to do your usual social activities, or social activities with your family'. The instrument consists of 27 items, each with a seven-point Likert-type response scale. Domain scores are calculated by taking the average of the responses to the items in each domain; averaging all 27 items gives a global score. Studies on the psychometric properties of the Mac New report it to be valid, reliable (α=0.8), and responsive,

simple to administer and the scale has also been shown to be well-accepted by patients with myocardial infarction (Lim et al, 1993; Valenti et al, 1996). Furthermore, the MacNew was favourably reviewed by Dempster & Donnelly, (2000) in their review of HRQL instruments.

4.2.5 Functional Outcome

The Functional Limitations Profile (FLP; Patrick & Peach, 1989) is the British version of the widely used American Sickness Impact Profile (SIP; De Bruin et al, 1992) (Appendix 19). Patrick and Peach (1989) translated the SIP into British English, renamed and rescored it to use British item weights. The aim of the scale is to assess changes in function due to ill-health. The scale consists of 136 items within 12 categories of activity. Four categories were selected for use in study 5. These were ambulation, mobility, recreation and social interaction. Each category contains items which describe a restriction in activity (e.g. I walk more slowly) and the respondents are required to indicate whether the item applied to them today and if it is due to their health. Scores for each category are calculated by adding the item-weighted values for each item which the respondent has endorsed, and considers is due to their health. This total is then divided by the maximum possible score for that category, and multiplied by 100 to obtain the FLP category score. Psychometric properties of the scale are good; a review by De Bruin et al (1992) of 120 studies using measures of functional outcome concluded that it was a good, valid and reliable instrument. In addition, Charlton et al (1983) have also reported the FLP to have acceptable reliability and validity, with a test-retest reliability of 0.95 for the overall scale, 0.98 for the physical dimension, and 0.85 for the psychosocial scale.

4.2.6 Medication Adherence

The Medication Adherence Report Scale (MARS; Horne, Weinamn & Hankins, 1999) was developed to measure adherence to a wide-range of medication regimes (see Appendix 20). It assesses how often patients have been non-adherent, by assessing various non-adherent behaviours. The 5-item scale asks respondents to rate the frequency with which they engage in each of five aspects of non-adherent behaviour, for example 'I forget to take them' on a five point scale (5=never; 4=rarely; 3=sometimes; 2=often; 1=very often). Scores for each of the 5 items are summed to give a scale score ranging from 5 to 25, where higher scores indicate higher levels or reported adherence. The instructions for the MARS are phrased in a non-threatening manner, making non-adherent responses more acceptable in order to reduce the social pressure on patients to under-report non-adherence, which is a problem in this field. The MARS has exhibited high internal reliability (α= 0.83) and high test-retest reliability, r=0.97 (Horne, Weinman & Hankins, 1999). Table 4.3 outlines the measures used for each of the outcome variables

Table 4.3 Summary table for the measures used for the outcome variables

Construct	Name of Measure	Authors	Year	Number of Items	Rating Scale
Depression and Anxiety	The Hospital Anxiety and Depression Scale (HADS)	Zigmond & Snaith	1983	14	0-3 point scale
Health Behaviour	General Preventive Health Behaviours Checklist (GPHB)	Amir	1987	29	Three response categories; 'always', 'sometimes' and 'do not do'
Health Behahviours	General Preventive Health Behaviours Checklist –Brief	Amir	1987	8	Three response categories; 'always', 'sometimes' and 'do not do'
Health Behaviour	Health Behaviour Scale	Weinman, Petrie, Sharpe & Walker	2000	11	6-point scale ranging from 'Never' to 'Everyday'.
Health Behaviour	Health Related Behaviours Scale	Ogden & Mtandabari	1997	5 domains	Yes/No, frequency response and 5-point scale ranging from 'not at all' to 'extremely'
Benefit Finding	Benefit Finding	Urcuyo, Boyers, Carver & Antoni	2005	17	4-point scale ranging from 'I disagree a lot' to 'I agree a lot'
Quality of Life	MacNew	Valenti, Lim, Heller & Knapp	1996	27	7-point scale
Functional Outcome	The Functional Limitations Profile (FLP)	Patrick & Peach	1989	4 categories	Yes/ No
Medication Adherence	Medication Adherence Report Scale (MARS)	Horne, Weinman & Hankins	1999	5	5-point scale ranging from 'never' to 'very often'

Chapter 5: Prevalence of Type D Personality in the UK and Ireland: Associations with Health Behaviour and Social Support

5.0 Abstract

Background: Type D personality (high negative affectivity and high social inhibition) is predictive of adverse outcome and psychological distress in patients with coronary heart disease (CHD). However, the mechanisms by which Type D affects health are unknown. It was predicted that (a) Type D individuals would engage in less health-related behaviour and (b) have lower levels of social support than non-Type D individuals. A further aim was to investigate the prevalence of the Type D personality pattern in a British population for the first time.

Methods: A cross-sectional design was employed. One thousand and twelve healthy young adults (225 males, 787 females, mean age: 20.7 years) from throughout the UK completed measures of Type D personality (DS14), health behaviours (GPHB), social support (SNSS) and neuroticism (EPQR-S).

Findings: The prevalence of Type D was found to be 38.5%, significantly higher than reported in other European countries. In addition, Type D individuals reported performing significantly fewer health-related behaviours and lower levels of social support than non-Type D individuals. These relationships remained significant after controlling for neuroticism.

Discussion: The link between Type D and CHD may be explained by Type D individuals performing fewer health related behaviours and experiencing less social support than non-Type D individuals.

5.1 Introduction

As described in Chapter 2, there is growing evidence to suggest a potential link between Type D and CHD. However, the question remains as to the specific mechanisms by which Type D is associated with CHD. There are several possibilities which may help to explain the link between Type D and cardiac morbidity and mortality. One possibility is that Type D may be linked to ill-health through psychophysiological mechanisms (e.g. cardiovascular reactivity). A second possibility is that Type D may affect health through more psycho-social mechanisms. The current study will examine two possible psychosocial mechanisms (health behaviour and social support). Pedersen & Denollet (2006) have outlined several possible mechanisms which may link Type D and poor prognosis, these are shown in Figure 5.1. The current chapter focuses on the role of psychosocial mechanisms, whereas psychophysiological mechanisms are described further in Chapter 7, Section 7.1.6.

Genes → Type D Personality

PSYCHOPHYSIOLOGICAL   **BEHAVIOURAL**

Cardio-vascular reactivity | Hemostatic changes | Activation of the HPA-axis | Unhealthy lifestyle | Poor compliance

Endothelial damage | Release of stress hormones

Inflammation

Adverse Clinical Outcome
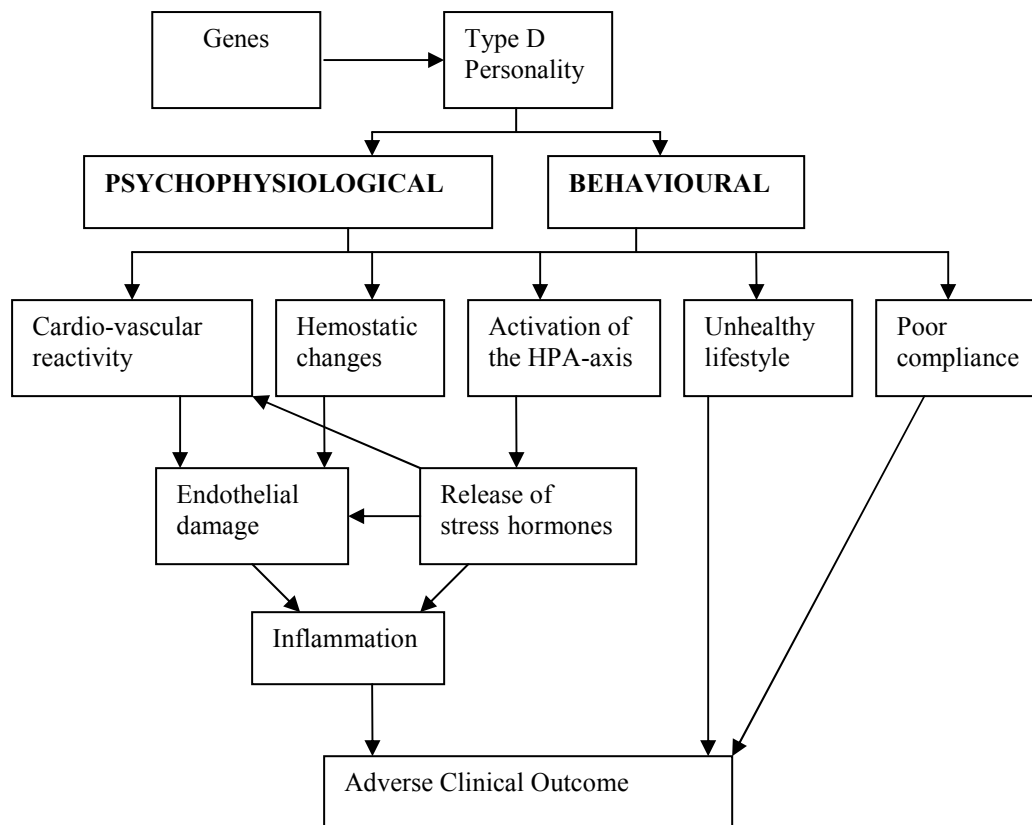
Figure 5.1 Potential mechanisms linking Type D personality with adverse clinical outcome, adapted from Pedersen & Denollet (2006).

5.1.1 Type D Personality and Psychosocial Mechanisms

Mechanisms linking Type D and ill-health may operate indirectly through behavioural mechanisms including health related behaviours, thus Type D personality could cause damage to the cardiovascular system by influencing lifestyle choices and practices. It is this possibility which is the focus of the current study. Type D may be associated with unhealthy behaviour such as smoking, poor diet and lack of exercise which would in turn will lead to an increased risk of mortality and morbidity. For example, poor diets are associated with hypertension and coronary heart disease (Knoops et al, 2004) and exercise decreases blood pressure and the risk for morbidity and mortality in CHD (Kahn, 1963).

Not only would establishing a relationship between Type D and health behaviour be important in explaining the mechanism between Type D and ill-health, it may also suggest that Type D may be a risk factor for poor health in general. Furthermore, the Type D construct has previously been criticised as not providing an obvious opportunity for treatment strategies (Lesperance & Frasure-Smith, 1996) due to the fact that personality is generally considered to be stable across time and situations. However, if Type D is associated with health related behaviour, then this would provide a clear target for intervention as health behaviours are potentially modifiable.

To date the relationship between Type D and health behaviours has not been investigated specifically. However, Pedersen et al (2004) found a relationship between Type D status and smoking in their study of CHD patients. Type D individuals were more likely to smoke compared to non-Type D individuals (37% vs. 29%). In addition, it is known that socially inhibited individuals are less likely to engage in health-promoting behaviour (Kirkcaldy, Shephard & Siefen, 2002). Furthermore, Schiffer and colleagues recently investigated a further possible behavioural link between Type D and adverse prognosis. In their study of CHF patients they found that those patients with a Type D personality showed sub-optimal consultation behaviour as they were less likely to report their cardiac symptoms to their nurse or cardiologist, despite experiencing more cardiac symptoms than non-Type D individuals (Schiffer et al 2007). Therefore, it is important to further investigate the relationship between Type D and health behaviour using a more comprehensive measure of health behaviour.

A further mechanism by which Type D may influence health outcomes is via poor social support. People with Type D personality are known to experience higher levels of perceived social alienation and to be more socially withdrawn than non-Type D individuals (Denollet et al, 1996), which may in turn lead to a reduced social support. This is important as an inverse association has been demonstrated between social support and mortality (Berkman & Syme, 1979), demonstrating that individuals with higher levels of social support have better health outcomes. Therefore, Type D individuals may have a poorer outcome due to lower levels of social support. Indeed, a recent study by van den Broek et al (2007) found that Type D patients without a partner reported more symptoms of anxiety and depression compared to Type D patients with a partner.

5.1.2 Type D Personality Prevalence Rate

A further primary research objective was to investigate the prevalence of Type D personality in a British population. To our knowledge, no other studies have investigated Type D personality in a population from the UK. There currently exists no data on the Type D construct within either British or American populations. Indeed, Denollet has pointed to the fact that "more research is needed to examine the cross-cultural validity of Type D" (Denollet, 2005, p95) in order to extend the findings which have been largely based on Belgian and Dutch cardiac patients. Therefore, a further aim of this study is to investigate the prevalence of Type D personality within the UK and Ireland.

In addition, because the Type D construct has been criticised as being just another measure of negative affectivity or neuroticism (Lesperance & Frasure-Smith, 1996),

the current study will test whether any relationships demonstrated between Type D and social support, and Type D and health-related behaviour remain after controlling for the effects of neuroticism.

5.1.3 Hypotheses

The hypotheses for the current study are as follows;

(i) due to high rates of CHD in the UK and Ireland it is hypothesised that prevalence rates of Type D personality may be higher in the UK and Ireland than the rates established previously in the rest of Europe;

(ii) Type D personality will be associated with lower levels of perceived social support;

(iii) Type D personality will be associated with maladaptive health behaviours, and

(iv) these relationships will remain after controlling for the effects of neuroticism.

5.2 Methodology

5.2.1 Participants

In total, 1012 healthy young adults took part in this study (787 females, 225 males). They were an opportunity sample recruited from eight universities throughout the UK and Ireland. Three hundred and sixty nine participants (267 females, 102 males) were recruited from three Scottish Universities, 240 participants (199 females, 41 males) were recruited from two English Universities, 193 participants (158 females, 35 males) were recruited from two Universities in Northern Ireland and 210 participants (163 females, 47 males) from one university in the Republic of Ireland. The mean age of the participants was 20.7 years (SD=4.94) and the ages ranged from 17-56 years. The men (mean=20.8, SD=5.16) and women (mean=20.7, SD=4.87) did not differ

significantly in terms of age, t (1, 1010) = 0.152, ns. In addition, the nationalities did not differ significantly in terms of age, F (5, 1006)= 0.740, ns, or gender χ^2 (6, N=1012)=6.59, ns.

I collected the data from one of the Scottish Universities, while collaborators collected the remaining data. Madeleine Grealy from Strathclyde University, and Julia Hay and Derek Johnston from Aberdeen University collected the remaining Scottish data. Chris Lewis from Ulster University and Noel Sheehy from Liverpool John Moore's University collected the data from Northern Ireland. In addition, Daryl O'Connor from Leeds University, and Eamonn Ferguson from Nottingham University collected the English data. Finally, Brian Hughes and Siobhan Howard from NUI Galway collected the data from the Republic of Ireland.

5.2.2 Measures

Socio-demographic variables included age, gender, nationality (whether participants identified as being British, Scottish, English etc.) and country of birth. In addition, all participants were asked to complete the following psychological measures:

5.2.2.1 Type D Personality

Type D Personality was assessed using the Type D Personality Scale (DS14; Denollet, 2005). This is a 14-item scale comprising of 2 subscales (see Appendix 1). A 7-item subscale which measures negative affectivity, and a 7-item subscale measuring social inhibition. Both subscales were internally consistent in the current study (Cronbach's α =.85 and .82 for NA and SI respectively).

5.2.2.2 Health Behaviour

Health behaviour was measured using a shortened version of the General Preventive Health Behaviours Checklist (GPHB; Amir, 1987) (see Appendix 14). The original form of this measure comprises 29 behaviours, including items drawn from the Alameda County study (Belloc & Breslow, 1972). This measure was shortened to eight items for use in the current study. These items were selected as being the eight preventive health behaviours on which groups of respondents who were found to be in 'very good', 'good' and 'average to very poor' health following medical assessment significantly differed (Amir, 1987). Cronbach's α for the present sample is .42 indicating low internal consistency. However, for the purposes of the current study, the behaviours are not intended to be considered as a scale, but rather as separate items in order to examine the relationship between Type D and specific health behaviours.

5.2.2.3 Neuroticism

Neuroticism was assessed as some theorists believe that Type D may be just another measure of neuroticism or depression (e.g. Lesperance & Frasure-Smith, 1996), therefore by including a measure of neuroticism it can be examined whether any relationships between Type D and health behaviour or social support remain significant after controlling for the presence of neuroticism. This dimension was measured by using the 12-item short version of the neuroticism subscale of the revised Eysenck Personality Questionnaire (EPQR-S) (Eysenck, Eysenck & Barrett, 1985) (see Appendix 4). This measure was found to be internally consistent in the current study (Cronbach's α=.77).

5.2.2.4 Social Support

Social support was measured using a shortened version of the Quality of Social Network and Social Support Questionnaire (SNSS; Dalgard, Bjork & Tambs, 1995) (see Appendix 2). Cronbach's α=.64 demonstrating acceptable internal consistency for the present sample. Although it could be argued that this measure does not meet Nunnally's (1978) criterion of α=.70 for internal consistency, this would have acted only to attenuate the strength of the relationship between the variables.

5.2.3 Procedure

All participants were recruited during undergraduate psychology classes and asked to complete the questionnaire pack, they were given a brief introduction of what the study would require and invited to participate. Ethical approval had been obtained from each of the University Psychology Department's ethics committee prior to testing.

5.2.4 Statistical Analyses

In order to test whether the Type D prevalence rate observed in the current sample is significantly different from that observed in other studies z-tests for the equality between proportions were calculated. A multivariate analysis of variance was employed to examine the differences between Type D and non-Type D individuals on levels of social support and neuroticism. In addition, due to the assertion of some authors that Type D is simply another measure of negative affect an analysis of covariance (with Neuroticism as the covariate) and a formal test of mediation were performed following Baron and Kenny's (1986) conditions for mediation. In order to examine any differences between Type D and non-Type D individuals on the health

behaviour items, a series of chi-square analyses were performed. Following this, Baron and Kenny's conditions for mediation (1986) were tested in order to determine the mediating effect of neuroticism on the relationship between Type D and the health behaviours.

5.3 Results

5.3.1 Prevalence of Type D Personality

From the sample of 1012 participants, 390 (312 females and 78 males) were classified as Type D (38.5%) by using the recommended cut off point of ≥ 10 on both NA (M=11.61; SD=5.41) and SI (M=10.27; SD=5.19) sub-scales. This corresponds to 39.6% of females and 34.7% of males being categorised as having a Type D personality. There was no effect of gender on Type D status, χ^2 (1, N=1012)=1.83, ns. In addition, there was no significant effect of nationality on Type D classification, χ^2 (6, N=1012)=16.32, ns. Z-tests for the equality between two proportions were calculated to determine if the Type D prevalence found in this study is significantly higher than that found in other countries. It was found that the prevalence in the UK and Ireland established in the current study is significantly higher than that of Holland (21%) (Denollet, 2005) (z=3.6, p<0.001), Italy (28%) (Gremigni & Sommaruga, 2005) (z=2.3, p<0.05) and Germany (25%) (Grande et al, 2004) (z=6.6, p<0.001).

5.3.2 Type D Personality, Social Support and Neuroticism

A MANOVA was carried out to examine differences between Type D and non-Type D individuals in their levels of social support and neuroticism. Gender was also entered as a factor in the analysis. Type D individuals reported significantly lower levels of social support (M=12.74; SD=3.7) than non-Type D individuals (M=14.68;

SD=3.06; F(1,1010)=127.48, p<0.001). In addition, females (M=13.09; SD=3.0) reported significantly higher rates of social support than males (M=12.67; SD=3.23; F(1,1010)=5.27, p<0.05). There was no gender x Type D interaction F(1,1010)=1.56, ns. Cohen's *d* = 0.57, indicating a medium effect size for Type D on social support.

In addition, levels of neuroticism were significantly higher in the Type D participants (M=7.17; SD=2.69) compared to the non-Type D individuals (M=4.83; SD=2.8; F(1, 1010)=303.86, p<0.001). Again, there was an effect of gender on neuroticism, with females (M=5.95; SD=2.9) reporting significantly higher levels of neuroticism compared to males (M=4.8; SD=3.2; F(1,1010)=26.49, p<0.001). There was no gender x Type D interaction, F(1,1010)=2.85, ns. Cohen's *d* = 0.85, indicating a large effect size for the effect of Type D on neuroticism. Furthermore, ANCOVA revealed that the relationship between social support and Type D remained significant after controlling for the effects of neuroticism, with Type D individuals reporting significantly lower levels of social support (M=11.72; SD=2.99) than non-Type D individuals (M=13.82; SD=2.81; F(1,1109)=41.5, p<0.001).

Formal mediation analysis was also carried out in order to determine if neuroticism mediates the relationship between Type D and social support. Following the procedure outlined by Baron and Kenny (1986), to test for mediation, a series of hierarchical regressions were performed. According to Kenny et al. (1998), mediation is demonstrated when the following conditions are met: (1) the independent variable (i.e., Type D) affects the mediator (i.e., neuroticism); (2) the independent variable affects the dependent variable (i.e., social support); (3) the mediator affects the dependent variable when the independent variable is controlled for and; (4) full

mediation is confirmed when the association between the independent variable and dependent variable is reduced to non-significance after the effect of the mediator is controlled for. If conditions 1-3 are met partial mediation is indicated. Sobel tests were also conducted in each case in order to determine if there had been a significant reduction in the relationship between the dependent and independent variables (Baron and Kenny, 1986).

Initial regression analysis showed that Type D significantly predicted neuroticism indicating that condition 1 for mediation was met, β=0.481, t(1011)=17.43, p<0.001. Type D was a significant predictor of social support at step 1, β=-0.335, t(1011)=-11.29, p<0.001) indicating that condition 2 for mediation was met. Condition 3 was met because when neuroticism entered the equation at step 2 it significantly predicted social support, β=-0.2, t(1011)=-6.0, p<0.001, and reduced the beta weight for Type D, β=-0.239, t(1011)=-7.2, p<0.001), but not to non-significance. Therefore, given that condition 4 was not met, partial mediation is indicated. A Sobel test confirmed the relationship between Type D and social support has been significantly reduced, z=-5.65, p<0.001.

5.3.3 Type D Personality and Health Behaviour

Chi-square analysis revealed significant differences between Type D and non-Type D participants on health behaviours as presented in Table 5.1. Type D individuals were significantly less likely to eat sensibly (χ^2 (2, N=1012)=3.62, p<0.05) compared to non-Type D individuals. In addition, they were significantly less likely to spend time outdoors (χ^2 (2, N=1012)=14.23, p<0.001) compared to non-Type D participants. Furthermore, Type D individuals were significantly less likely than non-Type D

individuals to get a regular medical check-up (χ^2 (2, N=1012)=4.02, p<0.05). Type D participants were also significantly less likely to avoid letting things get them down compared to non-Type D participants (χ^2 (2, N=1012)=66.54, p<0.001). There were no significant differences between Type D and non-Type D individuals with regards to getting enough sleep (χ^2 (2, N=1012)=0.53, p=0.257), smoking (χ^2 (2, N=1012)=1.2, ns), getting enough exercise (χ^2 (2, N=1012)=2.18, ns) or avoiding crossing the streets against the traffic lights (χ^2 (2, N=1012)=0.03, ns).

Table 5.1 Type D personality and health-related behaviour

| Health Behaviour | Type D | | Non-Type D | | χ^2 | p |
	Do not do or sometimes do	Always	Do not do or sometimes do	Always		
Eat Sensibly	275	121	392	224	3.62	.033
Avoid crossing the street against the traffic lights	324	72	501	115	.038	.457
Get enough sleep	288	108	435	181	.526	.257
Spend time outdoors everyday	202	194	240	376	14.23	<.001
Do not smoke	149	247	253	363	1.20	.152
Get enough exercise	322	74	477	139	2.19	.81
Avoid letting things get me down	360	36	425	191	66.54	<.001
Get a regular medical check-up	348	48	513	103	4.02	.027

Formal mediation analyses were conducted to determine if neuroticism mediates the effect of Type D on health-related behaviours. Initial regression analysis showed that Type D significantly predicted neuroticism indicating that condition 1 for mediation

was met, β=0.481, t(1011)=17.43, p<0.001. Each of the significant Type D-health behaviour relationships will now be considered in turn. For eat sensibly, Type D was not a significant predictor at step 1, β=-0.06, t(1011)=-1.9, ns, therefore condition 2 for mediation was not met.

For spend time outdoors, Type D was a significant predictor at step 1, β=-0.119, t(1011)=-3.8, p<0.001, indicating that condition 2 for mediation has been met. Neuroticism then entered the equation at step 2, significantly predicting eat sensibly, β=-0.014, t(1011)=-0.087, p<0.05 and reducing the beta weight for Type D to β=-0.077, t(1011)=-2.17, p<0.05 indicating that condition 3 for mediation was met. As the relationship between Type D and eat sensibly was not reduced to non-significance, condition 4 for mediation was not met, indicating that partial mediation has occurred. A Sobel test confirmed that the relationship between Type D and eat sensibly had been significantly reduced, z=-2.31, p<0.05.

For get a regular medical check-up, Type D was a significant predictor at step 1, β=-0.063, t(1011)=-2.01, p<0.05, fulfilling condition 2 for mediation. However, condition 3 for mediation was not met as neuroticism did not predict medical check-up when entered at step 2, β=-0.005, t(1011)=-0.14, ns, thus indicating that neuroticism does not mediate the relationship between Type D and medical check-up.

For avoid letting things get them down, Type D was a significant predictor at step 1, β=-0.256, t(1011)=-8.43, p<0.001 fulfilling condition 2 for mediation. Neuroticism then entered the equation at step 2, significantly predicting the behaviour, β=-0.376, t(1011)=-11.54, p<0.001 and reducing the beta weighting of Type D to β=-0.075,

t(1011)=-2.31, p<0.05, fulfilling condition 3 for mediation. As the relationship between Type D and avoid letting things get them down was not reduced to non-significance condition 4 for mediation was not met, indicating that partial mediation has occurred. A Sobel test confirmed that the relationship between Type D and avoid letting things get me down had been reduced, z=-8.93, p<0.001.

5.4 Discussion

The study had four main aims: (i) to investigate the prevalence rate of Type D personality in a healthy young British sample, (ii) to further investigate the relationship with Type D personality and social support, (iii) to investigate whether there is a relationship between Type D personality and health related behaviour, and (iv) to investigate if these relationships remain significant after controlling for neuroticism.

5.4.1 Prevalence Rate

The first aim of the study was to establish a prevalence rate for Type D personality in the UK. This is the first study to have examined Type D within a UK population. A prevalence rate of 39% was found using the standard Type D classification cut off points of ≥ 10 on both NA and SI subscales (no regional differences were found across the UK). This compares to rates of between 21% and 32.5% found elsewhere in Europe (Grande et al, 2004; Gremigni & Sommaruga, 2005; Denollet et al, 2005). A list of prevalence rates in healthy and cardiac participants established using the DS14 is given in Table 5.2.

Table 5.2 Type D Prevalence Rates in Europe

Country	Type D Prevalence- Healthy Participants	Type D Prevalence- Cardiac Participants
UK & IRELAND (present study)	39%	33.9% (Chapter 8)
GERMANY (Grande et al, 2004)	32.5%	25%
ITALY (Gremigni & Sommaruga, 2005)	n/a	28%
HOLLAND (Denollet, 2005)	21%	28%

It is important to consider reasons why the Type D rate is higher within the UK. There are a number of possibilities. First, it could represent a cultural difference between the UK and the rest of Europe. People from the UK are commonly thought to be more socially inhibited and less likely to show emotion than people from other cultures (Todd & Shapira, 1974). This so-called 'British stiff upper lip' could lead to increased scores in social inhibition, one of the components of Type D Personality.

The high rate of Type D personality observed may reflect the high rates of CHD found in the UK and Ireland (Allender et al, 2006; Peterson et al, 2005). At the moment it is unclear if Type D is a predictor of CHD or only a predictor of recovery in patients with already established CHD. If Type D is established as a predictor of CHD then it should not be surprising that the prevalence rate in the UK is higher than in other countries. One important way in which the Type D research needs to develop is by the identification of the direction of causality by which Type D affects health. This is needed in order to identify if Type D is a contributory factor for CHD or if it is important only as a predictor of recovery in patients with established CHD.

However, a further possibility is that the rate is high due to the nature of the sample. For example, the sample is younger than has been used in previous research and consists of university students who are known to suffer from high rates of psychological distress (Furr et al, 2001). This factor could have led to elevated scores on the social inhibition and negative affectivity subscales and consequently an increased Type D prevalence rate. However, Type D is suggested to be a stable personality trait, so should not change across the lifetime, however to-date stability has only been demonstrated over a 3-month period (Denollet, 2005). Furthermore, the sample is predominantly female which also contrasts with previous studies which have been carried out largely on male cardiac patients. It is important to consider whether a scale that has been developed primarily for the use with older male participants with health problems can be readily applied to a predominantly female, younger population with no health problems? A previous study from Pedersen & Middel (2001) found higher rates of Type D among female participants (41%) compared to males (26%). However, no other studies report any gender differences in prevalence rates.

A further consideration is the current recommended classification cut-off points. Denollet (2005) has suggested using a cut-off of ≥10 on both the social inhibition and negative affectivity subscales of the DS14. This recommendation was based on a median split of the NA and SI scores among the cardiac patients used in the study which validated the new DS14 scale (Denollet, 2005). Prior to this there had been no standard way of assessing Type D. It may be important to consider alternative ways of classifying Type D, for example by using a more stringent cut-off or by developing

different cut-off points for males and females, for different age groups or for healthy and non-healthy participants.

5.4.2 Type D Personality and Social Support

The present study also extends previous research on the relationship between Type D and social support by suggesting that Type D individuals report lower levels of perceived social support than non-Type D's. This is consistent with Denollet et al's finding that Type D individuals reported increased levels of social alienation (Denollet et al, 1996). The present findings suggest that Type D may influence health indirectly via impaired social support. The importance of social support within a health context has been established for a number of years, with evidence consistently suggesting an inverse relationship between social support and mortality (Berkman & Syme, 1979).

5.4.3 Type D Personality and Health Behaviour

A further aim of the current study was to investigate the relationship between Type D personality and health-related behaviour, as this may represent one way in which Type D has an adverse effect on health. It was hypothesised that Type D individuals would perform fewer health-related behaviours (e.g. eating sensibly, taking regular exercise) compared to non-Type D's and that this would in turn cause damage to the cardiovascular system. Type D individuals were found to perform fewer health-related behaviours. Type D individuals were found to spend less time outdoors, they were less likely to eat sensibly they failed to avoid letting things get them down and were less likely to get a regular medical check-up compared to non-Type D's. These relationships remained significant in the presence of neuroticism, with only the

relationships between Type D and avoid letting things get me down, and Type D and spending time outdoors being partially mediated by neuroticism

The relationship observed in the current study between Type D and unhealthy behaviour supports the previous finding that Type D individuals are more likely to be smokers than non-Type D individuals (Pedersen et al, 2004). This suggests that Type D individuals are more likely to engage in detrimental health practices which may in part explain the link between Type D and ill-health. This is an important finding for two reasons. Firstly, it suggests that Type D may represent a global health risk, which might be associated with poor health in general rather than specific to cardiac problems. Secondly, if Type D does influence health indirectly via health behaviours, then this provides one possible route for interventions by helping individuals to modify their behaviours.

5.4.4 Limitations

Limitations of the present study should be noted. Firstly, the generalisability of the findings to a cardiac population is limited by the fact that the sample consisted of healthy young adults. In addition, the study is limited by its cross-sectional design. Furthermore, although neuroticism is controlled for, we acknowledge that it would also have been beneficial for the current study to include a measure of depression to examine if it has any confounding effect on the observed relationship between Type D and health related behaviour. Additionally, it would have been beneficial to include a prospective dimension in the study. Similarly, the addition of an outcome measure (e.g. health status) would have made it possible to demonstrate a pathway between Type D, health behaviours and health outcome. At the moment it is only possible to

demonstrate an association between Type D and health behaviour. Also, this study relied exclusively on self-report measures, incorporating both objective and subjective measures would be beneficial in further research.

5.4.5 Conclusions and Future Research

The current study has extended the existing research on Type D personality in several key ways. First, it has added to the cross-cultural evidence on Type D by identifying, for the first time, the prevalence of Type D personality in the UK, which was established as 39%. Second, two possible mechanisms by which Type D may indirectly influence health have been identified. Previous findings on the link between Type D personality and social alienation have been extended by finding that in a healthy population, Type D individuals have lower levels of perceived social support compared to non-Type D's. Additionally, the relationship observed in the current study between Type D and unhealthy behaviour provides a further route by which Type D may affect health and also represents a potential route for intervention. Furthermore, the relationships between Type D and social support and Type D and health behaviours could not be explained by neuroticism.

Future research is needed to test if these are robust and replicable findings, and to investigate if the relationship between Type D and health behaviour is consistent over time. In addition future research should aim to investigate further direct and indirect mechanisms by which Type D personality affects health. This should be done prospectively with cardiac patients.

The following chapter will describe two studies which investigate further the relationship between Type D and health related behaviour. The first, involved healthy participants completing measures at two time points, in order to investigate if the relationship observed here between Type D and health behaviour is consistent across time. The second study, also investigating Type D and health behaviour, uses several measures of health-related behaviour and social support in order to extend the evidence on possible Type D mechanisms of effect.

Chapter 6: Type D Personality, Health Behaviour and Social Support: Further Evidence

6.0 Abstract

Background: The results reported in Chapter 5 suggest that Type D personality is associated with both impaired social support and lower levels of health-related behaviour. Moreover, these relationships were found to remain significant after controlling for neuroticism. Hence, the central focus of the two studies reported in this chapter was to extend our knowledge of these relationships. Experiment 6.1 investigates the relationship between Type D personality, social support, health-related behaviour and neuroticism, and the stability of each of these measures over time. Experiment 6.2 utilises further measures of social support and health-related behaviour in order to further our understanding of the specific nature of the relationship between Type D, health-related behaviour and social support.

Methods: In Experiment 6.1, 204 healthy young adults completed measures of Type D personality (DS14; Denollet, 2005), social support (SNSS; Dalgard, Bjork & Tambs, 1995), health-related behaviour (GPHB; Amir, 1987) and neuroticism (EPQR-S; Eysenck, Eysenck & Barrett, 1985). One hundred and four participants (51% follow-up) completed the same measures approximately 12 weeks later. In Experiment 6.2, 211 healthy young adults completed measures of Type D personality (DS14; Denollet, 2005), two measures of social support (SNSS; Dalgard, Bjork & Tambs; MOS-SSS; Sherbourne & Stewart, 1991), three measures of health-related behaviour (GPHB-Brief; Amir, 1987; Weinman, Petrie, Sharpe & Walker, 2000; Ogden & Mtandabari, 1997), and neuroticism (EPQR-S; Eysenck, Eysenck & Barrett, 1985).

Findings: The prevalence of Type D personality was found to be 43.6% and 39.3% in Experiment 6.1 and Experiment 6.2 respectively. In addition, Type D individuals

reported significantly lower levels of social support in both studies, even after controlling for neuroticism. Experiment 6.1 also found that Type D individuals reported significantly fewer health-related behaviours compared to non-Type D individuals. However, Experiment 6.2 failed to replicate the majority of the findings relating to health behaviour. In addition, the Type D construct was found to be reasonably stable over time, with 76.7% of the sample being classified in the same way across both time points.

Discussion: The findings of both studies provide further evidence for the possible role of health-related behaviour and social support in explaining the link between Type D and adverse prognosis in cardiac patients.

6.1 Introduction

The findings reported in Chapter 5 (see Section 5.3.3) are suggestive of a relationship between Type D personality and health-related behaviour, and Type D personality and social support. Moreover, these relationships remained significant after controlling for neuroticism. These findings are important as they provide evidence of two possible mechanisms by which Type D may affect adverse clinical prognosis in cardiac patients. Given these promising findings, the current chapter describes two studies which sought to investigate these relationships further.

The first study aims to investigate the relationship between Type D personality and health-related behaviour, and Type D and social support. It also investigates the stability of Type D personality and the other constructs over time by assessing participants on these measures at two time points 3-5 months apart. The second study utilises a number of measures of social support and health-behaviour. This was done

primarily to determine if the relationships between Type D and health-related

behaviour, and Type D and social support that were established in Chapter 5 are

robust. Using multiple measures of social support allows us to provide more detail

regarding the precise relationship between Type D personality and the various types

of social support available. In addition, the multiple measures of health behaviour will

provide a more comprehensive assessment of health-related behaviour, thus providing

further evidence relating to the exact nature of the relationship between Type D

personality and specific health-related behaviours. In addition, the measure of health

behaviour used in the previous study was limited in its scope, and used a very

simplistic scoring system which may lack sensitivity.

6.1.1 Hypotheses

The hypotheses for the current chapter are as follows;

(i) Type D personality will be associated with lower levels of perceived social support;

(ii) Type D personality will be associated with lower levels of health-related

behaviour;

(iii) these relationships will remain after controlling for the effects of neuroticism;

(iv) Type D personality will be a stable construct over time.

Experiment 6.1

6.2 Methodology

6.2.1 Participants and Procedure

Participants were 204 healthy young adults (41 males, 163 females, age M=22.2 yrs,

SD=6.97 yrs) who took part in the study for course credit. This sample was also used

as one of the Scottish samples in Chapter 5 (section 5.2.1). The men (M=21.05,

SD=5.96) and women (M=22.47, SD=7.19) did not differ significantly in terms of age

t (1, 202) = -1.17, ns. Prior to beginning the study, all participants were informed that participation was voluntary and confidential, and even if they agreed, they were free to withdraw at any stage. Ethical approval had been obtained from the University Psychology Department's ethics committee.

At Time 1, participants (n=204) completed a questionnaire pack including self-report measures of Type D personality, neuroticism, social support and health-related behaviour. Of this initial sample, 104 participants went on to complete the same self-report measures again at Time 2, between 12 and 20 weeks after time 1 (M=15.2, SD=2.34), representing a 50.9% response rate at Time 2. Participants not completing the Time 2 measures did not differ significantly from those who did with regards to age (t (1, 202)=-0.91, ns) or gender (χ^2 (2, N=204)=2.94, ns). In addition, they did not differ on any of the time 1 measures; social support (t (1, 202) =-0.68, ns), neuroticism (t (1, 202)=-6.9, ns), Type D (χ^2 (2, N=204)=0.51, ns), or health behaviour; eat sensibly (χ^2 (2, N=204)=0.43, ns), smoking (χ^2 (2, N=204)=0.61, ns), regular exercise (χ^2 (2, N=204)=0.58, ns), get enough sleep (χ^2 (2, N=204)=0.39, ns), spend time outdoors (χ^2 (2, N=204)=0.62, ns), avoid letting things get them down (χ^2 (2, N=204)=0.57, ns), or get a regular medical check-up (χ^2 (2, N=204)=0.61, ns).

6.2.2 Measures

6.2.2.1 Type D Personality

Type D Personality was assessed using the Type D Personality Scale (DS14; Denollet, 2005). It comprises 2 subscales (see Appendix 1). A 7-item subscale which measures negative affectivity, and a 7-item subscale measuring social inhibition. Both subscales

were internally consistent in the current study (Cronbach's α =.88 and .85 for NA and SI respectively).

6.2.2.2 General Preventive Health Behaviours Checklist-Brief (Amir, 1987)

Health behaviour was measured using a shortened version of the General Preventive Health Behaviours Checklist (GPHB; Amir, 1987) (see Appendix 14). The original form of this measure comprises 29 behaviours, including items drawn from the Alameda County study (Belloc & Breslow, 1972). This measure was shortened to eight items for use in the current study. Cronbach's α for the present sample is .36 indicating low internal consistency. However, for the purposes of the current study, the behaviours are not intended to be considered as a scale, but rather as separate items in order to examine the relationship between Type D and specific health behaviours.

6.2.2.3 Social Support

Social support was measured using a shortened version of the Quality of Social Network and Social Support Questionnaire (SNSS; Dalgard, Bjork & Tambs, 1995) (see Appendix 2). Cronbach's α=.74 indicating good internal consistency in the current sample.

6.2.2.4 Neuroticism

This dimension was measured by using the 12-item short version of the neuroticism subscale of the revised Eysenck Personality Questionnaire (EPQR-S) (Eysenck, Eysenck & Barrett, 1985) (see Appendix 4). This measure was found to be internally consistent in the current study (Cronbach's α=.80).

First, a MANOVA was performed to examine the differences between Type D and non-Type D individuals on levels of social support and neuroticism. In addition, cohen's d is used to provide an index of effect size. Cohen (1988) defined effect sizes as small, $d=.2$, medium, $d=.5$, and large, $d=.8$. Second, in order to test for the influence of neuroticism on the relationship between Type D and social support a formal test of mediation was performed using Baron and Kenny's (1986) conditions for mediation. Third, Chi-square analyses were performed to examine any differences between Type D and non-Type D individuals on health-related behaviour. In addition, formal tests of mediation were again computed to examine the influence of neuroticism on the relationship between Type D and health-related behaviour. An alpha level of $p<0.05$ is used throughout.

In order to assess the stability of neuroticism and social support, correlation analyses were conducted. The Kappa statistic (K) and percent agreement between responses (the proportion of participants who were grouped the same for Time 1 and Time 2) was used to determine the stability of the categorical variables (Type D and health behaviour). The strength of agreement between responses to categorical variables using kappa is defined as poor to fair (0.00-0.40), moderate (0.41-0.60), substantial (0.61-0.80) and almost perfect (0.81-1.0) (Landis & Koch, 1977). Percent agreement values greater than 66% are classified as fair (Portney & Watkins, 2000).

6.3 Results

<u>6.3.1 Stability of the Measures over Time</u>

In order to investigate the stability of social support and neuroticism over time correlation analyses were conducted. It was found that Time 1 social support was highly correlated with Time 2 social support, $r(102)=.76$, $p<.001$. In addition, a paired samples t-test revealed that there was no change in social support over time $t(1, 103)=-1.08$, ns. For neuroticism, Time 1 scores were moderately correlated with Time 2 levels, $r(102)=.65$, $p<.001$. A paired samples t-test again revealed no significant change in neuroticism scores over time $t(1, 103)=1.063$, ns. These results indicate that both social support and neuroticism showed acceptable levels of stability over time.

When assessing the stability of the Type D construct over time, it was found that 76.7% (as shown in Table 6.1) of the sample were classified the same (either Type D or non-Type D) on both occasions, $K=0.53$, indicating substantial strength of agreement between classification of Type D personality at Time 1 and Time 2. For health behaviour, the stability of each item is considered in turn. The percentage agreement and kappa values are presented in Table 6.1. The percentage agreements ranged from 75.4% to 87.2% indicating a good level of agreement on all items. In addition, kappa values ranged from 0.43 to 0.67 indicating moderate to substantial agreement between Time 1 and Time 2.

Table 6.1 Classification of Type D at Time 1 (T1) and Time 2 (T2)

	Type D T1	Non-Type D T1
Type D T2	34	12
Non-Type D T2	11	47

Table 6.2. Percentage agreement and kappa values for the health behaviour items between Time 1 and Time 2.

Health Behaviour	Percentage Agreement	Kappa (K)
Eat Sensibly	83.6%	0.54
Avoid crossing the street against the traffic lights	87.2%	0.53
Get enough sleep	82.4%	0.48
Spend time outdoors everyday	78.8%	0.55
Do not smoke	80.2%	0.52
Get enough exercise	87.1%	0.67
Avoid letting things get me down	83.7%	0.56
Get a regular medical check-up	75.4%	0.43

6.3.3 Type D Personality, Social Support and Neuroticism

A MANOVA was carried out to examine differences between Type D and non-Type D individuals in their levels of social support and neuroticism at Time 1. Gender was also entered as a factor in the analysis. Type D individuals reported significantly lower levels of social support (M=11.22; SD=3.24) than non-Type D individuals

(M=13.79; SD=2.95; F(1,202)=34.84, p<.001). In addition, females reported higher levels of social support (M=12.95; SD=3.23) compared to males (M=11.56; SD=3.5; F(1,202)=8.01, p<0.05). However, there was no significant interaction between Type D and gender F(1,202)=0.62, ns. Cohen's d=0.1, indicating a small effect size for Type D on social support.

In addition, levels of neuroticism were significantly higher in the Type D participants (M=7.55; SD=2.72) compared to the non-Type D individuals (M=4.6; SD=2.94; F(1, 202)=53.88, p<.001). Cohen's d=1.04, indicating a large effect size. There was no effect of gender of neuroticism F(1,202)=0.06, ns). Furthermore, ANCOVA revealed that the relationship between social support and Type D remained significant after controlling for the effects of neuroticism, with Type D individuals reporting significantly lower levels of social support (M=11.79; S.E=0.33) than non-Type D individuals (M=13.35; S.E=0.29; F(1,201)=11.23, p<.01).

6.3.4 Mediation Analyses on Type D, Neuroticism and Social Support

Formal mediation analysis was also carried out in order to determine if neuroticism mediates the relationship between Type D and social support at Time 1. Following the procedure outlined by Baron and Kenny (1996), to test for mediation, a series of hierarchical regressions were performed (see Chapter 5, section 5.3.3 for details on the conditions for mediation).

Initial regression analysis showed that Type D significantly predicted neuroticism indicating that condition 1 for mediation was met, β=0.459, t(203)=7.34, p<.001. Type D was a significant predictor of social support at step 1, β=-0.384, t(203)=-

5.902, p<.001) indicating that condition 2 for mediation was met. Condition 3 was met because when neuroticism entered the equation at step 2 it significantly predicted social support, β=-0.328, t(203)=-4.71, p<.001, and reduced the beta weight for Type D, β=-0.223, t(203)=-3.35, p<.01), but not to non-significance. Therefore, given that condition 4 was not met, partial mediation is indicated. A Sobel test confirms that there is a significant reduction in the relationship between Type D and social support, z=-3.98, p<.001.

6.3.5 Type D Personality, Health-Related Behaviour and Neuroticism

Chi-square analyses were conduced to determine the differences between Type D and non-Type D individuals on each of the eight health behaviours at Time 1, as presented in Table 6.1. It was found that Type D individuals were significantly less likely to eat sensibly (χ^2 (2, N=204)=14.77, p<.001) compared to non-Type D individuals. In addition, they were significantly more likely to be smokers compared to non-Type D individuals (χ^2 (2, N=204)=4.97, p<.05). Furthermore, Type D individuals were significantly less likely to engage in regular exercise compared to non-Type D individuals (χ^2 (2, N=204)=3.89, p<.05). There were no significant differences between Type D and non-Type D individuals with regards to getting enough sleep (χ^2 (2, N=204)=.003, ns), spending time outdoors (χ^2 (2, N=204)=3.11, ns), avoid letting things get them down (χ^2 (2, N=204)=1.15, ns), and get a regular medical check-up (χ^2 (2, N=204)=.004, ns).

Table 6.2 Type D personality and health-related behaviour at Time 1

Health Behaviour	Type D		Non-Type D		χ²	p
	Do not do or sometimes do	Always	Do not do or sometimes do	Always		
Eat Sensibly	81	8	79	36	14.78	<.001
Avoid crossing the street against the traffic lights	73	16	97	18	.195	ns
Get enough sleep	73	16	94	21	.003	ns
Spend time outdoors everyday	49	40	49	66	3.11	ns
Do not smoke	21	68	44	71	4.97	<.05
Get enough exercise	70	19	76	39	3.89	<.05
Avoid letting things get me down	83	6	111	4	1.15	ns
Get a regular medical check-up	73	16	93	22	.04	ns

6.3.5 Mediation Analyses of Type D, Neuroticism and Health-Related Behaviour at Time 1

Formal mediation analyses were conducted to determine if neuroticism mediates the effect of Type D on health-related behaviours at time 1. Initial regression analysis showed that Type D significantly predicted neuroticism indicating that condition 1 for mediation was met, $\beta=0.459$, t(203)=7.34, p<.001. Each of the significant Type D-health behaviour relationships is now considered in turn.

For eat sensibly, Type D was a significant predictor at step 1, $\beta=-0.269$, t(203)=-3.971, p<.001, indicating that condition 2 for mediation has been met. However, condition 3 for mediation was not met as neuroticism did not predict eat sensibly

when entered at step 2, β=-0.095, t(203)=-1.243, ns, thus indicating that neuroticism does not mediate the relationship between Type D and eat sensibly at Time 1.

For do not smoke, Type D was a significant predictor at step 1, β=0.156, t(203)=2.246, p<.05, indicating that condition 2 for mediation has been met. However, condition 3 for mediation was not met as neuroticism did not predict do not smoke when entered at step 2, β=0.075, t(203)=0.959, ns, thus indicating that neuroticism does not mediate the relationship between Type D and do not smoke at Time 1.

For get enough exercise, Type D was a significant predictor at step 1, β=-0.138, t(203)=-1.982, p<.05, indicating that condition 2 for mediation has been met. Condition 3 was met because when neuroticism entered the equation at step 2 it significantly predicted get enough exercise, β=-0.155, t(203)=-1.988, p<.05, and reduced the beta weight for Type D, β=-0.067, t(203)=-0.862, ns), to non-significance indicating that neuroticism fully mediates the relationship between Type D and get enough exercise at Time 1. A Sobel test confirms that the relationship between Type D and get enough exercise has been significantly reduced (z=-4.23, p<.001).

6.4 Discussion

There were three main aims in the current study. They were; (i) to investigate the relationship between Type D and social support, and Type D and health-related behaviour; (ii) to determine if these relationships remain significant after controlling for neuroticism, and (iii) to investigate the stability of Type D over time.

6.4.1 Type D, Social Support and Neuroticism

The present study also replicated the findings from Chapter 5, Section 5.3.2 and other studies (e.g. Denollet et al, 1996) with regards to the relationship between Type D and social support. It was found that Type D individuals reported significantly lower levels of perceived social support compared to non-Type D individuals. Again suggesting that impaired social support may represent one mechanism by which Type D leads to ill-health. In addition, the relationship between Type D and social support was only partially mediated by neuroticism.

6.4.2 Type D, Health-Related Behaviour and Neuroticism

Another aim of the current study was to investigate the relationship between Type D and health-related behaviour. It was found that Type D individuals performed significantly fewer health-related behaviours compared to non-Type D individuals. Specifically, Type D individuals were less likely to eat sensibly or take part in regular exercise, and were more likely to be smokers compared to non-Type D individuals. Moreover, the relationships between Type D and eat sensibly, and Type D and smoking were not mediated by neuroticism. These findings are consistent with the relationships between Type D and health behaviour that were reported in Chapter 5 (Section 5.3.3) and suggest a possible mechanism to explain the link between Type D and adverse prognosis in cardiac patients.

6.4.3 Stability of the Type D Construct

The final aim of the current study was to determine the stability of the Type D construct, and the other measures being used, over time. All of the measures demonstrated good stability. With regards to Type D, it was found that 76.7% of the

sample were classified the same (either Type D or non-Type D) at both time points, indicating a good level of consistency over time. Indeed, as Type D personality is intended to reflect a stable personality trait it would be expected that the agreement between Time 1 and Time 2 scores would be high. Although, the percentage agreement score of 76.7% is high, it means that almost one quarter of the sample were not being classified in the same way across the two time points. If Type D personality does indeed reflect a stable personality trait then perhaps the level of agreement across the two time-points should have been higher. Moreover, these measurements were only taken on average 3 months apart. Pelle et al (in press) report similar findings on the stability of the Type D construct, with 81% of cardiac patients being classified the same at two time points, three months apart. It is important for future research to investigate the stability of the Type D construct further, over longer periods of time, in order to determine if Type D does reflect a stable personality trait or something that may be more changeable over time.

6.4.4 Limitations

There are several limitations of the current study that should be noted. First, the generalisability of the findings to a cardiac population is limited by the fact that the sample consisted of healthy young adults. Second, the length of follow-up could have been longer in order to investigate the consistency of the measures over a greater period of time. Third, the health-behaviour measure that was used is limited in its scope and does not provide information on the full range of possible health-related behaviours, e.g. alcohol consumption. The problems associated with the assessment of health behaviour are discussed further in Section 6.8.2.

<u>6.4.5 Conclusions and Future Research</u>

The current study has extended the existing evidence on Type D in several key ways. First, it has provided further information on the prevalence rate of Type D in the UK, by finding a prevalence rate of 43% in the current sample. Second, it has replicated the findings from Chapter 5 concerning the relationships between Type D and social support, and Type D and health-related behaviour. Specifically, it was found that Type D individuals report significantly lower levels of social support and health-related behaviour compared to non-Type D individuals. Additionally, these relationships remained significant after controlling for neuroticism. Thus, a lack of health-related behaviour and social support may represent potential mechanisms by which Type D may affect health.

Future research should incorporate a longer follow-up period in order to further investigate the consistency of the Type D and social support, and Type D and health-related behaviour relationships over a longer period of time. In addition, it would be beneficial to assess participants on a wider range of health-behaviours (this has been done in study 2). Finally, it is important to assess these relationships prospectively with cardiac patients (see Chapter 8).

Experiment 6.2

The second study utilises a number of measures of social support and health-behaviour. This was done primarily to determine if the relationships between Type D and health-related behaviour, and Type D and social support that were established in Chapter 5 are robust. Using multiple measures of social support allows us to provide more detail regarding the precise relationship between Type D personality and the

various types of social support available. In addition, the multiple measures of health behaviour will provide a more comprehensive assessment of health-related behaviour, thus providing further evidence relating to the exact nature of the relationship between Type D personality and specific health-related behaviours. In addition, the measure of health behaviour used in the previous study was limited in its scope, and used a very simplistic scoring system which may lack sensitivity.

6.5 Methodology

6.5.1 Participants and Procedure

Participants were a new sample of 211 healthy young adults (35 males, 176 females, age M=21.23; SD=7.67). The men (M=21.17; SD=8.56) and women (M=21.24; SD=7.51) did not differ significantly in terms of age t (1, 209) = -.047, ns. Participants were recruited via an online experiment system, they received course credit in return for participation. All participants were informed that their participation was voluntary and confidential, in addition, they were told that they could withdraw from the study at any stage even after giving initial consent. All participants completed the following self-report measures outlined in the following section. Participants completed the measures online.

6.5.2 Measures

6.5.2.1 Type D Personality

Type D Personality was assessed using the Type D Personality Scale (DS14; Denollet, 2005), which is a 14-item scale comprising of 2 subscales (see Appendix 1). A 7-item subscale which measures negative affectivity, and a 7-item subscale measuring social

inhibition. Both subscales were internally consistent in the current study (Cronbach's α =.86 and .82 for NA and SI respectively).

6.5.2.2 Neuroticism

This dimension was measured by using the 12-item short version of the neuroticism subscale of the revised Eysenck Personality Questionnaire (EPQR-S) (Eysenck, Eysenck & Barrett, 1985) (see Appendix 4). This measure was found to be internally consistent in the current study (Cronbach's α=.75).

6.5.2.3 Social Support

6.5.2.3.1 Quality of Social Network and Social Support Questionnaire (Dalgard, Bjork & Tambs, 1995)

A shortened version of the Quality of Social Network and Social Support Questionnaire (SNSS; Dalgard, Bjork & Tambs, 1995) was used as a measure of perceived social support (see Appendix 2). Cronbach's α=.70 indicating good internal consistency in the current sample.

6.5.2.3.2 Medical Outcomes Study: Social Support Survey (Sherbourne & Stewart, 1991)

The Medical Outcomes Study: Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991) (see Appendix 3) is an 18-item measure which assesses four separate social support subscales; emotional/ informational support, tangible support, affectionate support, and positive social interaction. Cronbach's α=0.94 for the overall scale in the current sample, indicating excellent internal consistency. Each of the subscales also demonstrated excellent internal consistency; Cronbach's α=0.93; 0.93,

0.90, and 0.87 for emotional/informational support, tangible support, affectionate support, and positive social interaction respectively.

6.5.2.4 Health-Related Behaviour

6.5.2.4.1 General Preventive Health Behaviours Checklist-Brief (Amir, 1987)

Health behaviour was measured using a shortened version of the General Preventive Health Behaviours Checklist (GPHB; Amir, 1987) (see Appendix 14). The original form of this measure comprises 29 behaviours, including items drawn from the Alameda County study (Belloc & Breslow, 1972). This measure was shortened to eight items for use in the current study. Cronbach's α for the present sample is .34 indicating low internal consistency. However, for the purposes of the current study, the behaviours are not intended to be considered as a scale, but rather as separate items in order to examine the relationship between Type D and specific health behaviours.

6.5.2.4.2 Health Behaviour Scale- Weinman, Petrie, Sharpe & Walker (2000)

This Health Behaviour Scale (see Appendix 15) was used in Weinman, Petrie, Sharpe & Walker's (2000) study which examined causal attributions in first-time MI patients, and is designed to assess health behaviour over an average week. It is an 11-item scale reflecting a range of health behaviours. Internal consistency is not reported for this measure as it is not to be considered as a scale.

6.5.2.4.3 Health Related Behaviours – Ogden & Mtandabari (1997)

The health related behaviours measure (see Appendix 16) was developed by Ogden & Mtandabari (1997) in their study of examination stress and changes in mood and

health related behaviours. Participants are required to complete questions about five health related behaviours; smoking, alcohol consumption, eating behaviour, exercise, and sleep. Again, internal consistency is not reported as the items are not considered to be a scale.

<u>6.5.3 Statistical Analyses</u>

First, a MANOVA was performed to examine the differences between Type D and non-Type D individuals on levels of social support and neuroticism. An alpha level of p<0.05 is used throughout. In addition, cohen's *d* is used to provide an index of effect size. Cohen (1988) defined effect sizes as small, *d*=.2, medium, *d*=.5, and large, *d*=.8. Second, in order to test for the influence of neuroticism on the relationship between Type D and social support a formal test of mediation was performed using Baron and Kenny's (1986) conditions for mediation. Third, chi-square analyses were performed to examine any differences between Type D and non-Type D individuals on health-related behaviour. In addition, formal tests of mediation were again computed to examine the influence of neuroticism on the relationship between Type D and health-related behaviour.

6.6 Results

<u>6.6.1 Type D Personality, Social Support and Neuroticism</u>

A MANOVA was carried out to examine the differences between Type D and non-Type D individuals in their levels of social support and neuroticism. In addition, gender was included as a factor in the analysis. Type D individuals reported significantly higher levels of neuroticism (M=8.06; SD=2.27) compared to non-Type D individuals (M=4.5; SD=2.86; F(1, 209)=91.44, p<.001), and there was also an

effect of gender on neuroticism, with females (M=6.11, SD=3.1) reporting significantly higher levels of neuroticism compared to males (M=4.86; SD=3.28 $F_{(1, 209)}$=7.49, p<.01.) However, there was no interaction between Type D and gender $F_{(1, 209)}$=0.84, ns. Cohen's *d*=1.4 indicating a large effect size for the effect of Type D on neuroticism.

In addition, Type D participants reported lower levels of perceived social support (M=11.11; SD=3.07), as assessed by the SNSS, compared to non-Type D participants (M=13.62; SD=2.87; $F_{(1,209)}$=36.34, p<.001). Cohen's *d*=0.84 indicating a large effect size. There was no effect of gender on social support as assessed by the SNSS $F_{(1,209)}$=0.01, ns. Furthermore, Type D individuals reported lower levels of social support (M=3.74; SD=0.76), as assessed by the MOS-SSS, compared to non-Type D individuals (M=4.1; SD=0.66; $F_{(1, 209)}$=13.15, p<.001), cohen's *d*=0.5 indicating a medium effect size. Again, there was no effect of gender on social support $F_{(1,209)}$=1.05, ns. In addition, on closer examination of the MOS-SSS subscales, it was found that Type D individuals (M=3.64; SD=0.86) reported significantly lower levels of emotional/informational support compared to non-Type D individuals (M=4.02; SD=0.78; $F_{(1, 209)}$=11.46, p<.01, cohen's *d*=0.46 indicating a medium effect size. Type D individuals (M=3.68, SD=1.08) reported significantly less tangible support than non-Type D individuals (M=4.07; SD=0.96; $F_{(1, 209)}$=7.43, p<.01), cohen's *d*=0.38 indicating a small to medium effect size. In addition, Type D participants (M=3.79; 1.08) reported lower levels of affectionate support compared to non-Type D participants (M=4.23; 0.95; $F_{(1, 209)}$=9.388, p<.01), cohen's *d*=0.43 indicating a medium effect size. However, there were no significant differences

between Type D (M=4.01; SD=0.66) and non-Type D individuals on reported positive social interaction (M=4.18; SD=0.71; F(1, 209)=2.472, ns).

A series of MANCOVA were then computed to determine if the relationships between Type D and social support remained significant after controlling for neuroticism. It was found that the relationship observed between Type D and social support (as measured by the SNSS), remained significant after controlling for neuroticism with Type D individuals (M=11.67; S.E=0.36) reporting significantly less perceived social support compared to non-Type D individuals (M=13.25; S.E=0.28; F(1, 208)=10.63, p<.01). Type D individuals (M=3.78; S.E=0.09) also reported significantly less social support (as assessed by the MOS-SSS), compared to non-Type D individuals (M=4.08; S.E=0.07; F(1, 208)=6.41, p<.05) after controlling for neuroticism. Furthermore, on examination of the sub-scales of the MOS-SSS, it was found that the Type D participants (M=3.66; S.E=0.1) reported significantly less emotional/informational support compared to non-Type D's (M=4.0; S.E=0.08; F(1, 208)=6.62, p<.05) after controlling for neuroticism. Type D individuals (M=3.66; S.E=0.13) also reported significantly less tangible social support compared to non-Type D's (M=4.09; S.E=0.09; F(1, 208)=6.5, p<.05) in the presence of neuroticism. However, there were no significant differences between Type D participants (M=3.7; S.E=0.13) and non-Type D participants (M=4.09; S.E=0.97; F(1, 208)=2.91, ns) in affectionate support after controlling for neuroticism.

6.6.2 Mediation Analysis for Type D, Social Support and Neuroticism

Formal mediation analysis was also carried out to determine if neuroticism mediates any of the relationships observed between Type D and social support. Initial

regression analysis showed that Type D significantly predicted neuroticism indicating that condition 1 for mediation was met, β=0.552, t(210)=9.56, p<.001. Each of the significant Type D-social support relationships is now considered in turn.

For perceived social support (as assessed by the SNSS), Type D was a significant predictor at step 1, β=-0.385, t(210)=-6.03, p<.001, indicating that condition 2 for mediation has been met. Neuroticism then entered the equation at step 2 significantly predicting perceived social support, β=-0.257, t(210)=-3.44, p<.01 and reducing the beta weight for Type D to β=-0.243, t(210)=-3.26, p<.01 indicating that condition 3 for mediation was met. As the relationship between Type D and perceived social support was not reduced to non-significance, condition 4 for mediation was not met, indicating that partial mediation has occurred. A Sobel test confirmed that relationship between Type D and social support was reduced, z=-3.25, p<.01.

For social support (as assessed by the overall score on the MOS-SSS), Type D was a significant predictor at step 1, β=-0.243, t(210)=-3.62, p<.001, indicating that condition 2 for mediation has been met. However, condition 3 for mediation was not met as neuroticism did not predict social support when entered at step 2, β=-0.072, t(210)=-0.89, ns, thus indicating that neuroticism does not mediate the relationship between Type D and social support. For emotional/informational support, Type D was a significant predictor at step 1, β=-0.228, t(210)=-3.39, p<.01, indicating that condition 2 for mediation has been met. However, condition 3 for mediation was not met as neuroticism did not predict emotional/informational social support when entered at step 2, β=-0.036, t(210)=-0.45, ns, thus indicating that neuroticism does not mediate the relationship between Type D and emotional/informational social support.

For tangible social support, condition 2 for mediation was met as Type D is a significant predictor at step 1, β=-0.389, t(210)=-2.73, p<.01. However, again neuroticism was not a significant predictor at step 2, β=0.042, t(210)=0.59, ns, therefore condition 3 for mediation was not met indicating that neuroticism does mediate the Type D-tangible social support relationship. Finally, for affectionate support, Type D was a significant predictor at step 1, β=-0.207, t(210)=-3.06, p<.01, indicating that condition 2 for mediation has been met. However, neuroticism was not a significant predictor of affectionate support when entered at step 2, β=-0.126, t(210)=-1.56, ns, therefore condition 3 for mediation was not met, indicating that neuroticism does not mediate the relationship between Type D and affectionate social support.

6.6.3 Type D Personality and Health-Related Behaviour

The first measure of health behaviour to be considered is the GPHB. Chi-square analysis was performed in order to investigate the differences between Type D and non-Type D individuals on each of the eight health behaviours of this scale. Type D individuals were found to be significantly more likely to smoke compared to non-Type D individuals (χ^2 (2, N=211)=4.27, p<.05). In addition, Type D individuals were significantly less likely to avoid letting things get them down compared to non-Type D individuals (χ^2 (2, N=211)=22.78, p<.001). However, there were no significant differences between Type D and non-Type D individuals on any of the other health-behaviours; eat sensibly (χ^2 (2, N=211)=0.8, ns), avoid crossing the street against the traffic lights (χ^2 (2, N=211)=0.343, ns), get enough sleep (χ^2 (2, N=211)=1.37, ns), spend time outdoors (χ^2 (2, N=211)=2.19, ns), get enough exercise (χ^2 (2, N=211)=0.71, ns), and get a regular medical check-up (χ^2 (2, N=211)=2.33, ns).

Table 6.3 Type D personality and health-related behaviour (GPHB)

Health Behaviour	Type D		Non-Type D		χ²	p
	Do not do or sometimes do	Always	Do not do or sometimes do	Always		
Eat Sensibly	55	28	77	51	.80	ns
Avoid crossing the street against the traffic lights	67	16	99	29	.34	ns
Get enough sleep	59	24	81	47	1.37	ns
Spend time outdoors everyday	39	44	47	81	2.20	ns
Do not smoke	21	62	50	78	4.72	p<.05
Get enough exercise	67	16	97	31	.71	ns
Avoid letting things get me down	80	3	89	39	22.78	<.001
Get a regular medical check-up	76	7	108	20	2.33	ns

Formal mediation analyses were performed to determine the influence of neuroticism on the relationship between Type D and smoking behaviour, and Type D and avoid letting things get me down. For smoking, Type D was a significant predictor at step 1, β=.142, t(210)=2.08, p<.05, indicating that condition 2 for mediation has been met. However, condition 3 for mediation was not met as neuroticism did not predict smoking when entered at step 2, β=0.042, t(210)=0.515, ns, thus indicating that neuroticism does not mediate the relationship between Type D and smoking behaviour. For avoid letting things get them down, condition 2 for mediation was met as Type D is a significant predictor at step 1, β=-0.329, t(210)=-5.029, p<.001. Neuroticism then entered the equation at step 2 significantly predicting avoid letting things get them down, β=-0.426, t(210)=-5.853, p<.001 and reducing the beta weight for Type D to β=-0.094, t(210)=-1.287, ns indicating that condition 3 for mediation

was met. As the beta weight for Type D was reduced to non-significance it was found that neuroticism fully mediates the relationship between Type D and avoid letting things get them down. Sobel test confirmed that the relationship between Type D and avoid letting things get them down had been significantly reduced ($z=-1.29$, $p<.05$).

The second measure of health-related behaviour to be considered is Weinman, Petrie, Walker & Sharpe's (2000) measure. A MANOVA was performed to examine the differences between Type D and non-Type D individuals on each of the health behaviours in the scale (as shown in Table 6.4). It was found that Type D individuals (M=3.08; SD=1.27) were significantly less likely to get 7-8 hours sleep each night compared to non-Type D individuals (M=3.68; SD=1.28; $F(1, 209)=10.96$, $p<.01$). However, there were no differences between the Type D individuals and non-Type D individuals on any of the remaining health behaviours as shown in Table 6.4. A formal test of mediation was performed to test the influence of neuroticism on the relationship between Type D and getting 7-8 hours sleep each night. Type D was a significant predictor at step 1, $\beta=-0.223$, $t(210)=-3.31$, $p<.01$, indicating that condition 2 for mediation has been met. Neuroticism then entered the equation at step 2 significantly predicting getting 7-8 hours sleep, $\beta=-0.171$, $t(210)=-2.13$, $p<.05$, reducing the beta weight for Type D to non-significance $\beta=-0.129$, $t(210)=-1.61$, ns indicating that condition 3 for mediation was met and that neuroticism fully mediates the relationship between Type D and getting 7-8 hours sleep each night. Sobel test confirmed that the relationship between Type D and getting 7-8 hours sleep each night has been reduced ($z=-2.03$, $p<.05$).

Table 6.4 Type D Personality and Health-related Behaviour (Weinman, Petrie, Walker & Sharpe, 2000)

	Type D		Non-Type D			
Health Behaviour	Mean	SD	Mean	SD	F	p
Exercise	2.83	1.26	2.93	1.22	.32	ns
Take vitamins	1.47	2.0	1.59	2.17	.15	ns
Take alternative remedies	.55	1.33	.71	1.31	.65	ns
Eat 5+ fruit & veg daily	2.58	1.22	2.67	1.44	.28	ns
Eat breakfast	3.72	1.43	3.63	1.59	.21	ns
Eat fried food	3.24	.92	3.05	1.01	1.99	ns
Drink alcohol	2.69	1.1	2.57	1.24	.48	ns
Get 7-8 hours sleep	3.08	1.27	3.68	1.28	10.96	p<.01

The third measure of health-related behaviour to be considered is Ogden & Mtandabari's (1997) measure. Each of the five domains of behaviour (smoking, alcohol, eating, sleeping and exercise) will be considered in turn. For smoking behaviour, chi-square analysis showed that there were no significant differences between Type D and non-Type D individuals on whether they ever smoked (χ^2 (2, N=211)=.306, ns). In addition, a MANOVA revealed that there were no differences between Type D individuals [day: (M=0.92; SD=3.27), week: (M=5.5; SD=20.59)] and non-Type D individuals on how many cigarettes they smoked each day or each week [day: (M=1.56; SD=3.95; F(1, 209)=1.54, ns), week (M=10.36; SD=26.44; F(1, 209)=2.01, ns)]. In addition, there were no significant differences between the Type D participants (M=.227; SD=0.91) and non-Type D participants in cigarette craving (M=0.55; SD=1.17; F(1, 209)=3.16, ns).

For alcohol consumption, chi-square analysis revealed no significant differences between Type D and non-Type D individuals on whether they ever drank alcohol (χ^2 (2, N=211)=.352, ns). In addition, a MANOVA revealed that there were no differences between Type D individuals [day: (M=1.06; SD=1.19), week: (M=8.26; SD=7.8)] and non-Type D individuals on how many alcoholic drinks they had each day or each week [day: (M=1.31; SD=1.56; F(1, 209)=1.50, ns), week (M=9.22; SD=10.26; F(1, 209)=.530, ns)]. In addition, there were no significant differences between the Type D participants (M=1.54; SD=0.77) and non-Type D participants in craving alcohol (M=1.38; SD=0.69; F(1, 209)=1.41, ns).

For sleeping behaviour, ANOVA revealed that Type D individuals (M=6.84; SD=1.43) slept for significantly fewer hours each night compared to non-Type D individuals (M=7.61; SD=2.42; F(1, 209)=6.79, p<.01). Formal mediation analysis was therefore calculated to determine the influence of neuroticism on the relationship between Type D and hours slept each night. Type D was a significant predictor at step 1, β=-1.74, t(210)=-2.56, p<.05, indicating that condition 2 for mediation has been met. However, condition 3 for mediation was not met as Neuroticism did not predict hours slept when entered at step 2, β=-).001, t(210)=-0.018, ns, thus indicating that neuroticism does not mediate the relationship between Type D and hours slept each night.

For exercising behaviour, ANOVA showed that there were no significant differences in hours spent exercising each week for Type D participants (M=3.57; SD=3.6) compared to non-Type D participants (M=4.62; SD=4.97; F(1, 209)=2.73, ns).

For eating behaviour, a MANOVA revealed that Type D individuals (M=3.21; SD=2.67) were significantly less likely to have time to eat compared to non-Type D individuals (M=2.51; SD=2.44; $F(1, 209)=3.95$, $p<.05$). Mediation analysis was then performed to determine the influence of neuroticism on the observed relationship between Type D and having time to eat. Condition 2 for mediation was not met as neuroticism is not a significant predictor of time to eat at step 1, $\beta=0.132$, $t(210)=1.926$, ns.

There were no significant differences between Type D (M=5.06; SD=2.69) and non Type D participants on when I work I eat snacks (M=5.11; SD=2.59; $F(1, 209)=.018$, ns). In addition, there were no significant differences between Type D (M=4.84; SD=2.66) and non-Type D individuals (M=4.81; SD=2.96; $F(1, 209)=.006$, ns) on when I'm tired I eat sweet foods. There were also no significant differences between Type D (M=5.76; SD=2.77) and non-Type D individuals (M=5.0; SD=3.07; $F(1, 209)=3.25$, ns) on I have breaks from work by eating. Furthermore, there were no significant differences between Type D (M=3.69; SD=2.68) and non-Type D (M=3.32; SD=2.71; $F(1, 209)=0.88$, ns) individuals on I have been eating all the time. In addition, there were no significant differences between Type D (M=3.69; SD=2.41) and non-Type D individuals (M=3.37; SD=2.53; $F(1, 209)=0.835$, ns) on I have been hungry all the time. There were also no significant differences between Type D (M=4.21; SD=2.94) and non-Type D individuals (M=3.67; SD=3.0; $F(1, 209)=1.14$, ns) on I have eaten a lot of chocolate. Finally, there were no significant differences between Type D (M=5.4; SD=3.07) and non-Type D individuals (M=5.86; SD=3.11; $F(1, 209)=1.12$, ns) on I have cooked myself a lot of meals.

6.7 Discussion

The current study had four main aims. They were, (i) to further investigate the relationship between Type D personality and social support by using two measures of perceived social support; (ii) to investigate more comprehensively the relationship between Type D personality and health-related behaviour by utilising three measures of health-related behaviour, and (iii) to determine if these relationships remain significant after controlling for neuroticism.

6.7.1 Type D Personality, Social Support and Neuroticism

The current study has again identified a relationship between Type D personality and social support. Results from both measures of social support used in the current study demonstrate that Type D individuals have lower levels of perceived social support compared to non-Type D individuals. More specifically, findings from the MOS-SSS show that Type D individuals experience lower perceived social support across a variety of domains (emotional/informational, tangible and affectionate) compared to non-Type D individuals. Thus, these findings add important clarity regarding the nature of the relationship between Type D and social support. In addition, the current findings replicate those in Chapter 5 and Study 1 of the current chapter which also found evidence that Type D individuals report lower levels of social support. Furthermore, it was again found in the current study that the relationship between Type D and social support cannot be explained by the presence of neuroticism.

6.7.2 Type D Personality, Health-Related Behaviour and Neuroticism

The findings from the current study regarding the relationship between Type D and health-related behaviour are less consistent. Three measures of health-related

behaviour were used in order to establish the nature of the relationship between Type D and a wide range of specific health-related behaviours. Findings from Chapter 5 (Section 5.3.3) and from Study 1 in the current chapter had identified that Type D individuals were less likely to perform a number of health-related behaviours, including, eating sensibly and engaging in regular exercise.

However, the current study failed to replicate the majority of these findings. Indeed, very few relationships between Type D and health-related behaviour were established. On the GPHB, Type D individuals were found to be significantly more likely to be smokers and were significantly less likely to avoid letting things get them down. Using Weinman et al's (2000) measure Type D individuals were found to be significantly less likely to get 7-8 hours sleep each night. Finally, using Ogden and Mtandabari's measure, Type D individuals were found to get significantly fewer hours sleep each night compared to non-Type D individuals. In addition, neuroticism was found to fully mediate 2 out of 4 of these relationships. Again, these inconsistent findings suggest that the self-report measurement of health-related behaviour is problematic. For example, the GPHB found a significant relationship between Type D and smoking behaviour, but this was not replicated on either of the other measures which also assessed smoking behaviour. Problems surrounding assessment of health behaviour are described further in Section 6.8.2.

6.7.3 Limitations

Limitations of the current study are as follows. First, the study is limited by the use of health-related behaviours measures which provide disparate findings on the same behaviours; the validity of such questionnaires is therefore questionable. In addition,

the generalisability of the findings to a cardiac population is limited by the fact that the sample consisted of healthy young adults.

6.7.4 Conclusions and Future Research

Existing evidence on Type D personality has been in extended in the current study. The Type D prevalence rate was established to be 39%, replicating the finding of the prevalence study reported in Chapter 5.The current study has also provided further evidence regarding possible mechanisms by which Type D may affect health. First, it has provided further confirmatory evidence on the relationship between Type D and social support, again suggesting that Type D individuals experience lower levels of social support compared to non-Type D individuals. The current study also identified significant relationships between Type D and several health-related behaviours, including smoking, sleeping and avoiding letting things get them down. However, the number of behaviours consistently emerging as significant is more limited that had been anticipated which may be due to problems with the assessment of health-related behaviour generally. In summary, the evidence suggests that social support may represent a potential mechanism by which Type D may affect health. However, the evidence regarding the role of health related behaviour as a mechanism is less consistent and robust.

Future research should assess these relationships prospectively with cardiac patients. In addition, in order to overcome difficulties with the retrospective self-report assessment of health-related behaviour using questionnaire methods, it may be advantageous to use a diary measure of health behaviour, which requires participants to keep a daily record of the behaviours that they engage in.

6.8 General Discussion

The results described in the current chapter make a substantial contribution to the understanding of the mechanisms by which Type D may affect health. In addition, the studies provide further evidence on the prevalence of Type D personality in the UK. With regards to Type D prevalence, when compared to studies carried out elsewhere in Europe (e.g. Denollet et al, 2005), the rates established here of 43.6% and 39.3% for study 1 and study 2 respectively, are significantly higher. In addition, these findings are in line with the prevalence rate of 39% that was established in the UK and Ireland prevalence study presented in Chapter 5. Thus, the evidence clearly points to a higher rate of Type D personality in the UK compared to other European countries.

The current findings on potential mechanisms, taken together with Denollet and colleagues' work, suggest that social support and health-related behaviour are two possible mechanisms by which Type D personality may lead to adverse prognosis in cardiac patients. Specifically, with regards to social support, Denollet et al (1996) found that Type D personality was associated with social inhibition in cardiac patients. The findings from the current study, taken in conjunction with the findings from Chapter 5 clearly support this earlier work by Denollet and colleagues by establishing an association with Type D and low levels of perceived social support.

The current studies also add to the evidence for behavioural mechanisms linking Type D and adverse prognosis. Previous research by Pedersen et al (2004) found that Type D individuals were more likely to be smokers compared to non-Type D individuals,

therefore, the current finding that Type D individuals engage in fewer health-related behaviours adds further evidence for the role of health behaviour as a possible mechanism linking Type D and ill-health. Although the results observed in the current studies are less consistent than the findings of Chapter 5, they are suggestive of a relationship between Type D and health-related behaviour.

6.8.1 Limitations

It is important to acknowledge the limitations of the current studies. First, the generalisability of both studies to a cardiac population is limited as the current studies were carried out with healthy young adults. Second, the studies are limited by the measures of health-related behaviours that were used; these problems are particularly evident in the second study in which the validity of the measures is questionable due to differing results on the same behaviours. Third, although Study 1 has added important information concerning the consistency over time of the relationships between Type D and social support, and Type D and health-related behaviour, it is important to incorporate longer follow-up periods in future studies.

6.8.2 Problems in Assessing Health Behaviour

As mentioned earlier, the findings related to Type D and health-behaviour is limited by the measures of health behaviour that were used. Indeed, it is important to question whether retrospective self-report questionnaires are a reliable way to assess health behaviour. When selecting the measures for inclusion in these studies it proved extremely difficult to find a recognised measure of health behaviour. Remarkably, there exists little or no reliability and validity data on such measures. Furthermore, many of these questionnaires utilise a yes/no scoring response which may not be

suitable for assessing something as complex as behaviour. The lack of reliable, well-validated measures of health behaviour represents a major problem for the field of Health Psychology as a whole. Future research is urgently required which investigates the reliability and validity of measures of health-behaviour, and different scoring systems that may be used.

6.8.3 Conclusions

To conclude, the results outlined in this chapter have provided strong evidence in support of social support and inconsistent evidence regarding health-related behaviour as two potential mechanisms by which Type D may affect health. In addition, the Type D prevalence rate was again found to be significantly higher than that observed in other countries.

The following chapter again focuses on identifying potential mechanisms by which Type D may affect health. In addition to the psychosocial mechanisms described in the current chapter it is also possible that Type D may have a deleterious affect on health through psychophysiological mechanisms, specifically via cardiovascular reactivity. The study described in the following chapter will therefore investigate the relationship between Type D personality and cardiovascular reactivity to stress.

Chapter 7: Type D Personality and Cardiovascular Reactivity to Stress

7.0 Abstract

Objectives: The purpose of the current study is to examine one possible psychophysiological mechanism that may explain the link between Type D personality and adverse prognosis. It was predicted that, (a) Type D individuals may experience increased cardiovascular reactivity to stress, and (b) Type D individuals will experience higher subjective feelings of stress compared to non-Type D individuals

Methods: Eighty four healthy young adults participated, (42 males, 42 females, mean age 22 years) who were either high or low Type D (screened from a larger sample of 415 participants). Participants completed a number of psychological measures (Type D personality, health behaviour, social support, neuroticism and stress arousal) and a stress inducing procedure involving a demanding mental arithmetic task. Blood pressure, heart rate, cardiac output and peripheral resistance were recorded throughout the experiment.

Results: Repeated measures ANOVA showed a significant group by time effect of Type D on cardiac output in male participants. Type D males exhibit significantly higher cardiac output during the stressor phase compared to non-Type D males. In addition, Type D individuals exhibited significantly higher feeling of subjective stress on the stress arousal checklist compared to non-Type D's.

Conclusions: The findings suggest that one way in which Type D may affect health in males is through increased cardiac output during stress. However, future studies are required to investigate this and other potential mechanisms within cardiac patients.

7.1 Introduction

As outlined in chapter 2, and shown in Figure 7.1 there are a number of possible mechanisms by which Type D may affect health. The studies described in chapters 5 and 6 have demonstrated that Type D is associated with health-related behaviours and social support, thus suggesting possible psychosocial mechanisms by which Type D may lead to adverse clinical outcome in cardiac patients. The purpose of the current chapter is to present a study which aimed to investigate a possible psychophysiological mechanism by which Type D may affect health. Specifically, the study investigates the association between Type D personality and cardiovascular reactivity to stress.
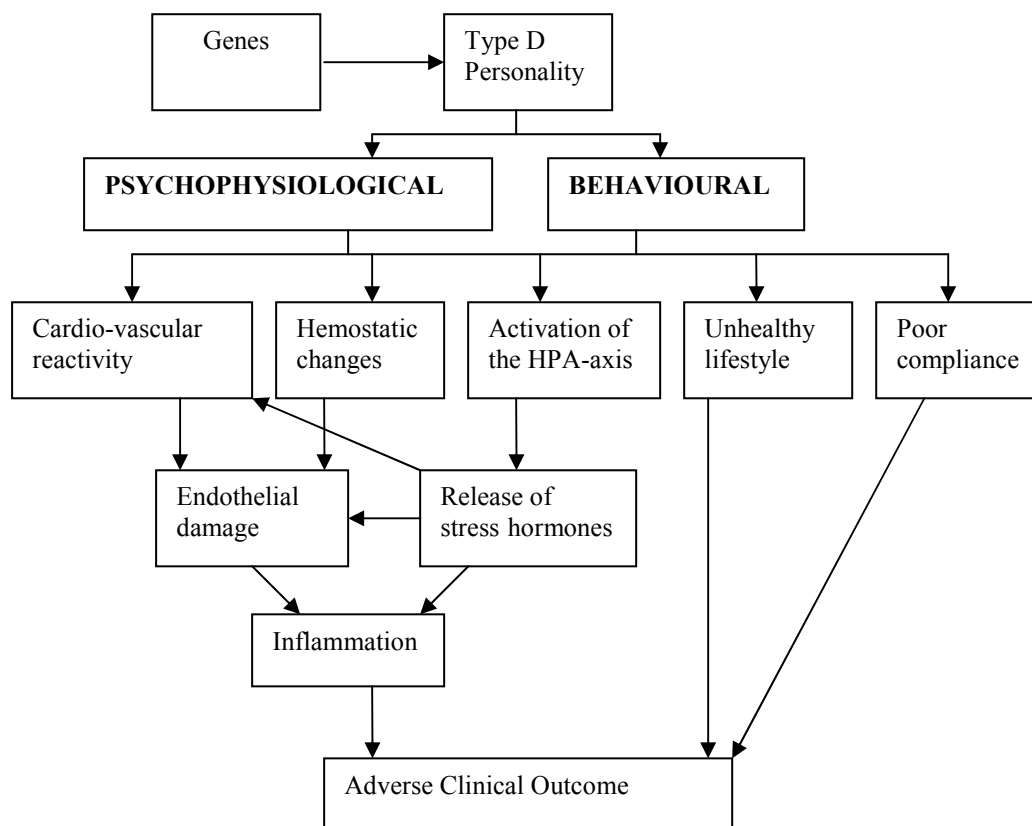
Figure 7.1 Potential mechanisms linking Type D personality with adverse clinical outcome, adapted from Pedersen & Denollet (2006).

It has been repeatedly demonstrated that stress has a negative effect on the cardiovascular system (Brotman, Golden & Wittstein, 2007). Research has demonstrated that acute physical stressors, such as, surgery, trauma and intense physical exertion are triggers of cardiovascular events. In addition, the role of emotional stressors as precipitants to cardiovascular events is increasingly been recognised (Brotman, Golden & Wittstein, 2007). For example, the risk of having a myocardial infarction is two times higher in the short period after an anger outburst compared to other periods (Strike et al, 2006). Indeed, emotional stress has been identified as a more common precipitant of acute infarction than physical exertion (Tofler et al, 1990).

Recent research on cardiovascular responses to stress has focussed on the reactivity hypothesis. The hypothesis suggests that exaggerated blood pressure and heart rate responses to stress can damage the cardiovascular system and may consequently lead these individuals to be at greater risk for the development of cardiovascular disease (Krantz & Manuck, 1984). Therefore, it is possible that Type D personality may have its effects on health through a direct psychophysiological mechanism. Specifically, the mechanism linking Type D to CHD may be that Type D individuals have a higher cardiovascular reactivity (CVR) in stressful situations compared to non-Type D individuals which in turn leads to the development of CHD.

7.1.1 Definition of Cardiovascular Reactivity

CVR reflects the physiological changes from a resting or baseline state to some type of psychological or physical challenge or stressor (Manuck et al., 1989). It is widely thought that individuals showing exaggerated cardiovascular responses to these

stressful conditions may be more at risk for the development of cardiovascular syndromes such as hypertension or coronary heart disease than those exhibiting relatively smaller responses (Manuck & Krantz, 1986).

Early theories concerning reactivity postulated that CVR was a risk factor for the development of future hypertension or CHD as opposed to being a direct causal factor in its development. However, more recently CVR has been identified as a causal factor in the development of both hypertension and CHD (Gerin et al, 2000). In hypertension, reactivity is thought to lead to increased peripheral resistance, which contributes to elevated blood pressure over time (Manuck, Kasprowicz & Muldoon, 1990). Hyperreactivity could lead to heart disease by causing injury to the endothelial lining of the arteries, thereby promoting the accumulation of plaque, which, over time can lead to acute events such as thrombosis or ischemia (Manuck, 1994).

7.1.2 Cardiovascular Reactivity and the Development of Cardiovascular Risk

A number of studies have examined the link between cardiovascular reactivity and the development of CHD. A recent review carried out by Treiber and colleagues (2003) examined the evidence linking cardiovascular reactivity to preclinical and clinical disease states. They found that three large epidemiological studies with follow-up periods of 20 years or more reported that blood pressure responses to the cold pressor test (this task involves placing a hand or forearm in cold water) were predictive of subsequent essential hypertension in initially normotensive participants (Wood et al, 1984; Menkes et al, 1989; Kasagi, 1995). In addition, a recent 9-12 year follow-up study by Tuomisto et al (2005) found that systolic blood pressure observed during psychological tasks predicted future systolic blood pressure level and that diastolic

blood pressure reactivity to active stressors improves the prediction of the need for antihypertensive medication.

7.1.3 Experimental Stressors

Research in the area of CVR has relied heavily on the use of laboratory stressors to invoke responses in individuals. Standardised mental stressors such as mental arithmetic tasks or public speaking provide a controlled way in which to examine the effect of mental stress on physiological variables. However, there are a number of problems associated with the use of such tasks which has resulted in the ecological validity of their use being questioned.

It is argued that CVR results obtained in the laboratory may not be generalizable to stressful experiences in everyday life (Kamarck & Lovallo, 2003). Indeed, Schwartz et al. (2003) suggest that there is little evidence that cardiovascular responses observed in the laboratory predict heart rate and blood pressure responses occurring in the real world. Studies (e.g. Pickering & Gerin, 1990; Manuck, et al, 1990) which have investigated the issue of generalizability have assessed subjects undergoing reactivity testing in the laboratory and then monitored their ambulatory blood pressure and heart rate during their normal activities. These studies have found only small associations. However, the inclusion of recovery responses and appropriate task selection improves the generalizability of experimental stressors. Also, more recently, Johnston, Tuomisto & Patching (in press) have demonstrated that reactivity in the lab predicts reactivity to stressors in real life.

7.1.4 Consistency of Cardiovascular Reactivity

An important aspect of the reactivity hypothesis is whether stress-related CVR exhibited by individuals is consistent across time. Indeed, reactivity has been described as a psychophysiological trait. In order for this to be the case, an individual's reactivity should be consistent across time and under different stimulus conditions. However, responses are usually assessed with a single stimulus presented on one occasion (Manuck, 1994). Studies investigating inter-task correlations for common stressor tasks such as mental arithmetic or the cold pressor task average between .40 to .50. In addition, retest correlations for heart rate and blood pressure are moderate (Manuck et al, 1989).

7.1.5 Cardiovascular Recovery

The majority of research on CVR has examined acute cardiovascular responses during a stressor, however, more recently attention has also turned to examine the recovery period following the stressor, i.e. focussing on how long it takes for an individual to return to their baseline levels following a stressor. Several studies have suggested that the length of time blood pressure and heart rate is elevated in addition to the initial peak reaction to the stressor may contribute to cardiovascular illness (Gerin & Pickering, 1995). For example, it is expected that individuals who take longer to recover from a stressor would be more likely to develop hypertension or atherosclerosis. A study by Borghi et al. (1986) found blood pressure carry-over was a strong predictor of future stable hypertension in a sample of borderline hypertensives and that carryover was a more useful predictor than reactivity. Therefore this study will investigate both acute responses to the stressor and responses during a post-stressor recovery time.

7.1.6 Type D Personality and Psychophysiological Mechanisms

7.1.6.1 Type D Personality and Immune Activation

Research that has sought to explain the link between Type D and ill-health through pathophysiological mechanisms has met with some success. In a preliminary study of 42 men with chronic heart failure, Denollet et al (2003) identified that Type D was a significant predictor of increased circulating levels of pro-inflammatory cytokine tumour necrosis factor (TNF-α), a factor associated with the pathogenisis of chronic heart failure (CHF). Although these results are based on a small cross-sectional sample, they do provide suggestive evidence for a link between Type D and immune activation, suggesting that Type D personality may be linked to the psychoneuroimmunological aspects of heart failure. More recently, Conraads et al (2006) found an association between Type D and increased circulating levels of TNF-α in a larger sample of CHF patients. These findings suggest that as well as attempting to uncover potential indirect mechanisms to explain the link between Type D and CHD (e.g. social support and health behaviours) it is also important to investigate further possible pathophysiological mechanisms such as CVR.

7.1.6.2 Type D Personality and HPA Axis Function

Recently, Whitehead et al (2007) investigated a further biological pathway by which Type D may affect prognosis. They assessed cortisol output in 72 patients who had recently suffered from acute coronary syndrome (ACS). Patients with Type D personality showed significantly higher cortisol awakening responses, independent of demographic and clinical factors and depression. This finding suggests that Type D may be associated with disruption of HPA axis function. Changes in HPA axis function may play a role in the pathogenesis of CHD (Girod & Brotman, 2004).

7.1.6.2 Type D Personality and Cardiovascular Reactivity

Habra et al., (2003) sought to investigate, for the first time, if there was a link between Type D and cardiovascular or neuroendocrine reactivity. Their study involved a sample of students completing an experimental stressor task (mental arithmetic task with harassment) while having their blood pressure and heart rate measured throughout a baseline, stressor and recovery period. In addition, saliva samples were collected at the end of the baseline and task periods in order to assess salivary cortisol levels.

Their results provide some limited support for the association between Type D and CVR. Although no associations were found between the global Type D construct and reactivity, the individual NA and SI components were significantly linked to blood pressure reactivity and cortisol reactivity. More specifically, SI was associated with heightened systolic and diastolic reactivity in the male participants. In addition, both NA and SI were found to be related to greater cortisol reactivity, again only in the male participants. The authors propose that their findings suggest a potential pathophysiological role for the Type D construct in the development of the disease, particularly in men.

The aim of the current study is to extend the research on Type D and cardiovascular reactivity carried out by Habra and colleagues. First, it is important to further investigate whether the global Type D construct (in addition to the separate components as established by Habra et al.) is associated with cardiovascular reactivity. Previous research has identified that personality factors influence CVR in stressful

situations (Fichera & Andreassi, 2000). Second, this study will utilise more comprehensive measures of physiology, by measuring cardiac output and peripheral resistance in addition to blood pressure and heart rate, whereas Habra's study only measured blood pressure and heart rate. Third, the current study will also include a recovery phase post-stressor in order to examine the role of Type D on recovery from stress, which also extends previous research which relied solely on responses during the stressor.

7.1.6.3 Hypotheses

The current study has four main hypotheses;

(i) Type D individuals will exhibit a differential cardiovascular response to stressful stimuli compared to non-Type D's;

(ii) The components of Type D (negative affectivity and social inhibition) will be related to cardiovascular responses to stress, in line with previous research carried out by Habra et al (2003)

(iii) The cardiovascular response to stress will be more evident in Type D males, as reported by Habra et al (2003), and

(iv) Type D individuals will demonstrate higher subjective feelings of stress following a stressor compared to non-Type D individuals. It is known that Type D individuals experience higher levels of distress than non-Type D individuals (Denollet, Sys & Brutsaert, 1995; Pedersen et al, 2004), this may be because they perceive situations as being more stressful than non-Type D's.

7.2 Method

7.2.1 Participants

Four hundred and fifteen healthy young adults (339 females) completed a screening questionnaire. Following this, a 2-stage selection process was carried out. First, participants were classified as Type D and non-Type D using the established cut off scores (Denollet, 2005). Second, in order to maximise the chances of detecting significant effects (i.e. statistical power) in this exploratory experimental comparison, we selected those participants who scored in the upper and lower quartiles of the negative affectivity and social inhibition subscales of the Type D Scale, for the laboratory study (i.e. for the top quartile scoring $\geq$ 13 on both the negative affectivity and social inhibition subscales, and for the lower quartile scoring $\leq$ 9 on both subscales). Through this process 166 participants (120 females) were identified and invited to take part in the experimental phase and from this 84 participants took part, representing a 50% recruitment rate. The respondents and non-respondents did not differ significantly in terms of age (t (1, 164) = 1.32, ns) or gender (χ^2 (1, N=166) = 6.34, ns). All participants were university students who took part in the study for course credit.

Participants in the experimental phase were 84 healthy young adults (42 females, age M=22.0 yrs, SD=6.8 yrs). The men (mean=21.0, SD=4.6) and women (mean=22.9, SD=8.5) did not differ significantly in terms of age, t (1, 82) = 1.26, ns. There were 24 Type D females and 21 Type D males who scored $\geq$ 13 on both the negative affectivity and social inhibition subscales of the DS14 Type D scale (Denollet, 2005). In addition, there were 18 non-Type D females, and 21 non-Type D males who scored $\leq$ 9 on both subscales. Traditionally, Type D personality is classified based on

Denollet's (2005) cut-off points of ≥10. Of course, participants in our study would also be classified as Type D or non-Type D using Denollet's recommended cut-off points. No participants reported either being in poor health or taking any medication that might influence the cardiovascular measurements.

7.2.2 Physiological Measures

Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), cardiac output (CO), and total peripheral resistance (TPR) were recorded throughout the experiment. These measurements were recorded using the FMS Portapres blood pressure monitor and Beatscope 1.0 (TNO, Biomedical Instrumentation Research Unit, Amsterdam, The Netherlands) which takes non-invasive blood pressure measurement and beat to beat haemodynamic monitoring. The instrument has been used extensively in cardiovascular reactivity research (e.g. Chafin et al., 2004; Wright et al., 2007). This technique uses a finger cuff which the participant wears on the third finger of the left hand which monitors finger arterial pressure continuously throughout the experimental session. Beatscope is a software package used for the analysis of arterial pressure waveforms. It enables the application of filters that correct for pressure wave distortion when the arterial pressure is obtained from a peripheral site, such as a finger artery.

7.2.3 Psychological Measures

7.2.3.1 Type D personality

This was assessed using the 14 item Type D personality scale (DS14; Denollet et al, 2005) (Appendix 1). This comprises a 7-item subscale which measures negative affectivity (NA) and a 7-item subscale measuring social inhibition (SI). Cronbach's α

was 0.91 and 0.90 respectively for NA and SI, demonstrating excellent internal consistency in the current study.

7.2.4 Affect Measures

7.2.4.1 Stress Arousal Checklist

Participants subjective feelings of stress were measured by the Stress-Arousal Checklist (Mackay et al, 1978) (Appendix 11). For the purposes of this experiment only the stress items were selected. Participants are required to respond to 19 words such as 'tense', 'worried' and 'jittery' on the following response categories 'definitely feel', 'slightly feel', 'cannot decide' and 'definitely do not feel' based on how they feel at the present moment. This gives each participant a score of 0-19. Participants completed the checklist at three times during the experiment; baseline, stressor and recovery.

Additional self-report measures of subjective feelings of stress were in the form of a visual analogue scale (VAS; 10cm) which were also administered at baseline, stressor and recovery.

7.2.5 Stressor Task

Paced Auditory Serial Addition Test (PASAT)

The PASAT mental arithmetic task was used as the experimental stressor (Gronwall, 1977). This task was selected as it has been shown in numerous studies to reliably perturb the cardiovascular system (Ring et al, 2002; Winzer et al, 1999). It also demonstrates good test-retest reliability (e.g. Willemson et al, 1998). In this task participants were required to add two sequentially presented single digit numbers

together. In order to do this, the participant is required to retain the latter number and add it to the next number presented, and so on. Numbers were presented using a tape recorder and answers given orally. If participants faltered they were instructed to start again with the next numbered pair. After completing a practice trial, the participants completed the first task phase in which 60 numbers were presented at a rate of one every 4 seconds, then the second sequence of 60 at one every 2 seconds. In total, the task lasted for 6 minutes, 4 minutes for the slower sequence and 2 minutes for the faster sequence. Participant performance was recorded by the experimenter.

7.2.6 Procedure

An outline of the experimental procedure is provided in Figure 7.1. Each participant arrived individually for the experiment. The experimenter explained that the participants' heart rate and blood pressure would be monitored during a mental arithmetic task. After the participant consented to take part they were seated at a table and the finger cuff of the blood pressure monitor was attached to them. Participants were then given a questionnaire pack to complete consisting of the measures of Type D personality, the stress arousal checklist and visual analogue scale for the first time. Following this, recording began for the five minute baseline period, during this time participants were asked to sit quietly and read a textbook.

After the five minute baseline period was completed, the experimenter began the PASAT mental arithmetic task (stressor), participants were given a practice trial to ensure that they understood the instructions of the task. Following this the stressor phase of the experiment began, starting with the presentation rate of one number every 4 seconds, immediately followed by a rate of one number every 2 seconds.

At the end of the mental arithmetic task, the experimenter turned off the Portapres, and removed the finger cuff from the participant, this was done to minimise discomfort for the participant in wearing the Portapres for a long period of time. At this point participants were asked to complete the stress arousal checklist and visual analogue scale for the second time. After this participants were instructed to sit quietly during a ten-minute rest period where they were again asked to read a textbook. Following this ten minute period, participants were re-attached to the Portapres for 5 minutes (recovery) where they were again asked to sit quietly and read a textbook. Upon completion of the recovery period, participants were asked to complete the stress arousal checklist and visual analogue scale for the final time. The participant was then debriefed before leaving the room.

```
0 min ─┐
       │  Habituation to Portapres, Participant completes questionnaires
       │  (Type D Scale, Stress Arousal Checklist) while wearing the Portapres
       │
10 min ─┤
       │  BASELINE Recording- Participant at rest, reading
15 min ─┤
       │
       │  STRESSOR Mental Arithmetic Task
       │
25 min ─┤
       │
       │
35 min ─┤
       │  RECOVERY recording- Participant at rest, reading
40 min ─┘
```
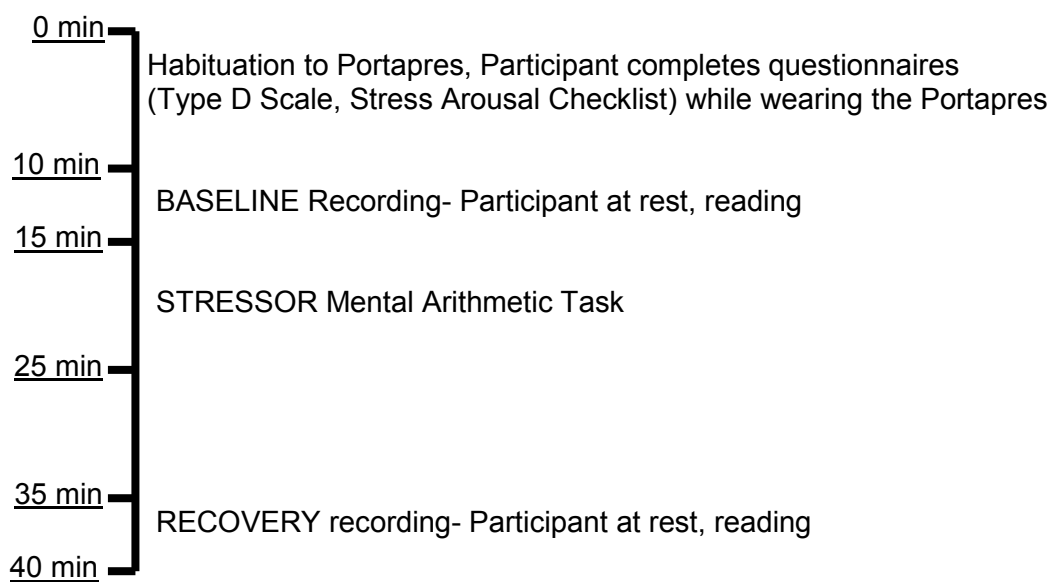
Figure 7.2 Outline of the Experimental Procedure

Four cardiovascular measures were examined: systolic blood pressure, diastolic blood pressure, heart rate and total peripheral resistance. These measures were assessed across three time periods: baseline, stressor and recovery. The stressor phase recordings were taken during the 2 second presentation rate of the PASAT. The average value for the cardiovascular measures at each time point is used as the dependent variable. In order to investigate the effect of Type D on each of the physiological dependent variables a series of mixed measures ANCOVA were computed across the three time periods (baseline, stressor, recovery) while controlling for initial levels of the dependent variable in each case (in order to control for individual differences in baseline levels and their impact on subsequent magnitude of change). As the assumption of sphericity was violated in each case, the Greenhouse-Geisser correction was used. It is this value that is reported in each of the analyses which follow. In addition, analyses were subsequently carried out separately for males and females, this was done because gender differences in reactivity studies are commonly observed (e.g. Habra et al, 2003). Furthermore, the effects of the components of Type D - negative affectivity and social inhibition - on each of the physiological measures was also investigated using mixed measures ANOVA. An alpha level of .05 was used throughout.

7.3 Results

7.3.1 Stress Manipulation Check

In order to establish that the mental arithmetic task was an effective stressor in producing physiological change, a series of repeated measures ANOVA were run on each of the dependent variables (heart rate, blood pressure, cardiac output and

peripheral resistance). For each outcome variable, a significant main effect of time was found. Mean scores for the baseline and stressor scores are presented in Table 7.1.

Table 7.1: Mean baseline and stressor values for the physiological data

Measurement	Baseline	Stressor	Recovery	F-value
HR	79.46 (9.87)	85.55 (10.1)	76.03 (12.15)	4.66 (p<.001)
SBP	122.83 (18.87)	142.34 (23.51)	117.99 (18.29)	5.23 (p<.01)
DBP	70.14 (13.28)	81.92 (15.97)	66.48 (13.62)	3.51 (p<.05)
CO	5.68 (1.26)	6.2 (1.26)	5.41 (1.32)	6.2 (p<.001)
TPR	0.98 (0.3)	1.09 (0.59)	1.01 (0.48)	3.56 (p<.05)

HR= heart rate (bmp), SBP= systolic blood pressure (mm HG), DBP= diastolic blood pressure (mm HG), CO= cardiac output (lpm), TPR= total peripheral resistance (dyn · s/cm^5).

7.3.2 Type D Personality and Physiological Data

Analyses revealed that the separate components of Type D, i.e., negative affectivity and social inhibition, were unrelated to the physiological variables. Therefore, all further analyses were conducted using the global Type D construct. Mixed measures ANOVA revealed a significant effect of time across each of the physiological variables (see Table 7.1). However, there was no overall time x Type D interaction for any of the physiological variables [HR: $F_{(2, 79)} = 0.01$, ns; SBP: $F_{(2, 79)} = 0.14$, ns; DBP: $F_{(2, 79)} = 0.04$, ns; TPR: $F_{(2, 79)} = 0.093$, ns; CO: $F_{(2, 79)} = 2.31$, ns].

There was a significant group effect of Type D on cardiac output ($F_{(3,79)} = 6.7$, p<0.03), but not on any of the other physiological measures [HR: $F_{(3,79)} = 0.004$, ns;

SBP: $F_{(3,79)} = 0.44$, ns; DBP: $F_{(3,79)} = 0.04$, ns; TPR: $F_{(3,79)} = 0.06$, ns; CO: $F_{(3,79)} = 6.7$, $p < .03$]. Given this significant group effect of Type D on CO, it is important to carry out further analyses to investigate any gender differences. A significant group x time effect of Type D on CO was found for males [$F_{(3, 37)} = 3.4$, $p < .05$] but not in the female participants [$F_{(3, 37)} = 0.78$, ns] as demonstrated in Figure 7.3. ANCOVA (controlling for baseline cardiac output) revealed that the difference in cardiac output between Type D's and non-Type D's occurs during the stressor phase $F_{(1, 82)} = 4.91$, $p < 0.05$. In the interests of completeness it should be noted that no further gender differences were found on the remaining physiological measures.
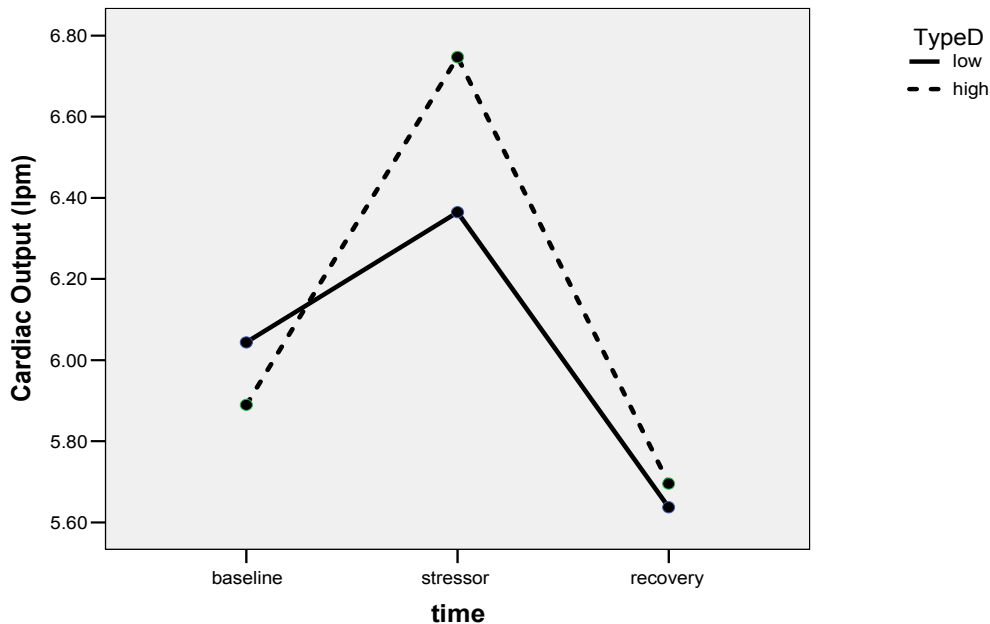
Figure 7.3: The effect of Type D on Cardiac Output in the male participants across the baseline, stress and recovery phases.

7.3.3 Type D Personality and Subjective Stress

It is also important to examine the effect of Type D personality on the participants' self-ratings of stress on both the stress arousal checklist and the visual analogue scale. Mixed measures ANOVA were again calculated across the three time points; baseline, stressor and recovery while controlling for initial levels of the dependent variable.

There was a significant effect of time on subjective stress arousal as measured by the stress arousal checklist $F(2, 82) = 99.02$, $p<.001$, and a significant group effect of Type D on stress arousal $F(1, 83) = 6.43$, $p<.03$, as shown in Figure 7.4, indicating that participants who were high on Type D personality reported significantly higher feelings of subjective stress compared to those low on Type D. In addition, a significant time x Type D interaction $F(2, 79) = 3.38$, $p<.05$ was established. ANCOVA (controlling for baseline subjective stress) showed that the difference in subjective stress between the Type D and non-Type D individuals occurred during the stressor phase, $F(1, 82) = 5.32$, $p<.05$.

For the ratings obtained from the visual analogue scale, there was a significant effect of time $F(2, 82) = 47.5$, $p<0.001$, but there was no group effect of Type D $F(1, 83) = 2.16$, ns, and no time x Type D interaction $F(2, 79) = 0.87$, ns. Again, in the interests of completeness it should be noted that no gender differences were found on either of the subjective measures of stress.
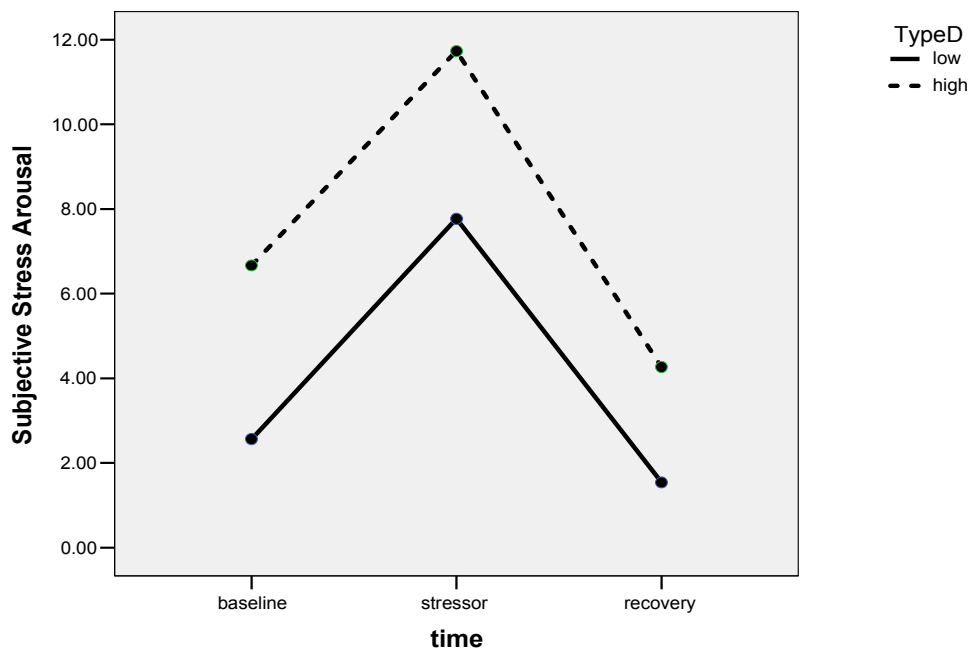
Figure 7.4: The effect of Type D on subjective stress arousal across the baseline, stress and recovery phases.

7.4 Discussion

The study had two main aims: (i) to investigate the relationship between Type D personality and cardiovascular reactivity to stress and, (ii) to investigate the relationship between Type D and subjective feelings of stress.

7.4.1 Type D Personality and Cardiovascular Reactivity

The first aim of the study was to establish if Type D individuals exhibit a differential pattern of cardiovascular reactivity to stress compared to non-Type D's. Type D's were compared to non-Type D's on several physiological measures; heart rate, blood pressure and cardiac output. Although no differences were found between Type D's and non-Type D's on measures of heart rate, blood pressure and peripheral resistance,

there was a significant effect of Type D on cardiac output in the male participants, with males high in Type D personality exhibiting significantly higher cardiac output during the stressor phase of the experiment compared to the non-Type D male participants. This is in line with previous research carried out by Habra et al (2003) who also identified differences in the reactivity of males who were high in the components of Type D – negative affectivity and social inhibition. However, their study failed to demonstrate any relationship between the global Type D construct and cardiovascular reactivity. The current study has therefore extended previous research by demonstrating, for the first time, a relationship between the Type D construct and cardiovascular reactivity.

The relationship between Type D and increased cardiac output during stress is important for a number of reasons. By establishing that Type D is related to heightened physiological reactions to acute stress, a further mechanism by which Type D may potentially influence health has been found. Specifically, increased cardiac output means that the heart has to work at an increased level in order to pump blood to the rest of the body during stress. Importantly, increased cardiac output over time has been implicated early in the disease course of hypertension (Julius, 1998).

7.4.2 Type D Personality and Subjective Stress

The second aim of the current study was to examine the relationship between Type D and subjective stress. It was found that Type D individuals report higher feelings of subjective stress during stressor compared to non-Type D's. Type D has previously been found to be related to a number of negative emotional states, such as anxiety and depression. Therefore, the association between Type D and heightened feeling of

stress provides further evidence for the link between Type D and psychological distress. Establishing a link between Type D and increased feelings of stress is particularly important given the potential role of stress in the aetiology of CHD.

7.4.3 Limitations

Several limitations of the present study should be noted. Firstly, the generalizability of the current findings to a more 'at-risk' population is limited by the fact that the sample consisted of healthy young adults. Secondly, as the experiment was conduced in the laboratory the findings may be limited to how Type D and physiology related to stress experienced in the lab, which may not be representative of stress experienced during daily life. However, a recent study by Johnston, Patching & Tuomisto (in press) has demonstrated that reactivity in the lab predicts reactivity to stressors in real life. Additionally, it would have been useful to include a prospective component to the study in order to test if the association between Type D and cardiac output is consistent across time. Finally, given the nature of Type D personality, it may have been better to use a social stressor task, such as the Trier Social Stress Task (Kirschbaum, Pirke & Hellhammer, 1993) rather than a cognitive stressor. However, my presence as experimenter during the PASAT may have acted as a possible inadvertent social stressor.

7.4.4 Conclusions and Future Research

The current study has extended the existing research on Type D in several important ways. First, it has identified for the first time that Type D is related to heightened physiology to acute stress in males. This may represent a direct physiological pathway by which Type D is associated with ill-health. Second, it has established that Type D

is associated with increased subjective feelings of stress following acute stress. These findings suggest that Type D individuals may be at a particular risk for stress-related cardiac events.

Future research is needed to test if these are robust and replicable findings, and to investigate if the relationship between Type D and cardiac output is also present in a cardiac population. Furthermore, in order to make the findings generalizable beyond laboratory stress ambulatory monitoring should be used to see if the relationships observed still hold as the individual faces daily hassles and stressors.

The study described in this chapter and those in chapters 5 and 6 have identified both psychosocial and psychophysiological mechanisms by which Type D may affect health. The following chapter will extend this research by investigating further mechanisms by which Type D may affect recovery from myocardial infarction.

Chapter 8: Predictors of Psychological Outcome Post Myocardial Infarction: A Prospective Study

8.0 Abstract

Objectives: This study assessed predictors of psychological outcome (adherence, quality of life, functional outcome, distress, benefit finding) at 3-months post-MI. There were three main aims; (i) to investigate the prevalence of Type D personality in the current sample; (ii) to determine whether personality predicts outcome after controlling for mood, and clinical and demographic variables, and (iii) to identify the mechanisms by which personality is associated with adverse psychological outcome.

Methods: In a prospective study, 191 MI patients completed a series of psychological measures (Type D personality, optimism, illness perceptions, locus of control, future thinking, beliefs about medicines, depression and anxiety) at Time 1, 3-7 days following MI. At Time 2, 3 months later, 131 of these MI patients completed measures of Type D personality, depression and anxiety, beliefs about medicines, quality of life, medication adherence, functional outcome, and benefit finding.

Results: Type D was found to be a relatively stable construct, with a prevalence of 33.9%. In addition, Type D was found to predict adherence, quality of life, functional outcome and benefit finding after controlling for demographics, MI severity and mood. The relationship between Type D and quality of life was mediated by illness perceptions. Findings also confirmed the importance of mood (depression and anxiety) in predicting quality of life and functional impairment post-MI, and the importance of illness perceptions in predicting quality of life post-MI. Finally, it was demonstrated for the first time that future thinking predicts quality of life, functional impairment and depression post-MI.

Conclusions: The current study found that Type D personality is a significant predictor of adherence, quality of life, functional outcome and benefit finding post-MI, independent of demographics, MI severity and mood. In addition, two further mechanisms (medication adherence and illness perceptions) to explain the association between Type D and adverse outcome were identified. It is, therefore, important to include personality factors in future research as they have been shown to predict short-term outcome in MI patients. In addition, the role of mood, illness perceptions and future thinking in predicting outcome post-MI requires further attention.

8.1 Introduction

The study described in the current chapter investigates predictors of outcome post-MI. In order to do this, five key outcome variables were selected. These are psychological distress, quality of life, functional outcome, medication adherence, and benefit finding. More specifically, the study aimed to determine the role and relative importance of a number of predictor variables, including personality and patient cognitions (described previously in Chapter 2) in a prospective study of MI patients. Crucially, the present study investigated potential mechanisms through which personality (Type D personality and optimism) may affect outcome in MI patients. The psychosocial variables to be investigated have been outlined previously in Chapter 2. The following sections delineate the outcome measures that are assessed in the current study, and the key studies relating to each variable.

8.1.1 Psychological Distress Post-MI

Symptoms of psychological distress are prevalent in MI patients (Lane et al, 2002). A number of studies have investigated the nature and duration of symptoms of anxiety and depression in patients in the years following an MI. These studies have found symptoms of depression and anxiety to be common problems in MI patients (e.g. Frasure-Smith, Lesperance & Talajic, 1995), and more prevalent than in the general population. Studies of MI patients report prevalence rates of depression ranging from 17-37% (Frasure-Smith et al, 1995; Ladwig et al, 1994) and prevalence rates of anxiety between 24-31% (Frasure-Smith et al, 1995, 1999). In addition, Lane et al (2002) examined symptoms of depression and anxiety in a prospective sample of nearly 300 MI patients. They assessed the patients at 3 time points; 2-15 days following MI, and 4 and 12 months subsequently. Rates of depression and anxiety

were found to be high at follow-up, the prevalence rates were 37.7% and 37.2% for depressive symptoms, and 41.8% and 40.0% for anxious symptoms at the 4 and 12 month follow-up periods, respectively.

Not only does the high prevalence of symptoms of anxiety and depression have important implications for psychological well-being, they also have implications for morbidity and mortality in MI patients (the impact of depression on quality of life is discussed further in Section 8.1.2). Indeed, studies have shown that depression is associated with a 2-7 fold increased risk in mortality (e.g. Barefoot et al, 2000; Frasure-Smith et al, 1999). In addition, studies have also demonstrated that depression has an independent effect on morbidity and quality of life (Ladwig & Roll, 1994; Mayou et al, 2000; Beck et al, 2001; Lane et al, 2001; Fauerbach et al, 2005; Dickens et al, 2006). A recent review by Stafford et al (2007) examined studies which have investigated the relationship between depression and quality of life in cardiac patients. They concluded that; (i) the prevalence of depression is disproportionately high in patients with CAD; (ii) depression confers an increased risk of mortality, and (iii) depressive symptoms significantly undermine quality of life even after successful medical and surgical treatment.

A recent large-scale prospective study undertaken by de Jonge et al (2006) provides further information relating to the effects of post-MI depressive disorder on health status, cardiac symptoms, disability, and quality of life. Their sample consisted of over 400 MI patients who were assessed at 3 and 12 months. Importantly, the authors were interested in determining whether the effects of depression on outcome are independent of baseline functioning and cardiovascular disease severity. They found

that patients with post-MI depressive disorder (as assessed by standardised psychiatric interview) were more likely to have poor quality of life, more health complaints, more cardiac complaints, and more disability at 12 months follow-up, compared to those not diagnosed with depressive disorder. Moreover, the association between post-MI depression and health status remained after controlling for cardiac condition and socio-demographic variables.

However, despite the large body of evidence that suggests that depression is prospectively associated with cardiac prognosis, it is important to note that symptoms such as loss of energy, insomnia, and loss of interest may be a direct *consequence* of having an MI, rather than being related to depression *per se* (Strik et al, 2001). Indeed, several authors (e.g. de Jonge et al (2006)) have pointed out that the reporting of depressive symptoms following MI may be confounded by complaints originating from the MI itself, such as fatigue, sleeping problems or appetitive problems (Irvine et al, 1999; Mendes de Leon, 1999). If post-MI depressive complaints originate even partially from the MI, the relationship between post-MI depression and prognosis would be confounded, and depression would not be an independent risk factor for post-MI prognosis (de Jonge et al, 2006). Furthermore, a recent meta-analysis of 22 studies suggested that the effects of depression post-MI were at least partly confounded by the size of the MI (van Melle et al, 2004).

Importantly, within the context of the aims of this thesis, de Jonge et al (2007) investigated the extent to which the relationships between both depression and Type D personality with outcome may be confounded by somatic health. They investigated the association of depressive disorder and Type D with baseline somatic health in a

sample of over 1000 post-MI patients. It was found that post-MI depression is more related to somatic health than Type D, at 12 months post-MI. The authors therefore conclude that confounding of cardiovascular effects of psychological distress by poor somatic health is more likely to occur in post-MI depression than in Type D personality.

Although the majority of research has focussed on the role of depressive symptoms when investigating psychological distress in MI patients, anxiety has also been identified as an important construct. Indeed, prevalence rates for anxiety have been found to be higher than those for depression (Havik & Maeland, 1990; Mayou et al, 2000). Furthermore, there is evidence to suggest that a significant number of MI patients experience persistent and unremitting anxiety. For example, Mayou et al (2000) reported a decrease in mean anxiety scores between hospital admission and 3 months but thereafter no changes were observed amongst the distressed patients. Furthermore, Lane et al (2002) also reported higher correlations between anxiety scores at 4 months and 1 year than those between baseline and 4 months. Moreover, approximately 40% of the MI patients were anxious at 4 months and 1 year post-MI. These findings suggest that anxiety is chronic problem in many post-MI patients.

Anxiety has also been identified as a predictor of outcome post-MI. For example, Moser and Dracup (1996) found that patients experiencing higher levels of anxiety were more likely to suffer from ischemic and arrhythmic complications. In addition, studies conducted by Lane et al (2001) and Mayou et al (2000) found that anxiety (as well as depression) was predictive of post-MI quality of life. More recently, Moser et al (2007) again identified that patients with higher levels of anxiety experienced

significantly more in-hospital complications compared to less anxious patients independent of traditional sociodemographic and clinical risk factors. In addition, they found that this relationship is moderated by perceived control, with the combination of high anxiety and low perceived control being associated with the highest risk of complications.

Given the important role of depression and anxiety as predictors of psychological outcome in MI patients, and the high prevalence of symptoms of depression and anxiety observed in MI patients, the current study will further investigate the role of depression and anxiety as both predictors of outcome, and as indicators of psychological distress post-MI.

8.1.2 Quality of Life Post-MI

As outlined in Chapter 1 (see section 1.4) the concept of quality of life has increased in importance as an outcome measure in clinical studies. Although there is no universally accepted definition of quality of life, the definition provided by the world health organisation (WHO) is adopted by the majority of studies. The WHO defines quality of life as a multidimensional concept in which 'an individual's perception of their position in life in the context of the culture and value systems in which they live in relation to their goals, expectations, standards and concerns'. More specifically, health-related quality of life has been defined as 'the functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient' (Schipper, Clinch & Olweney, 1996). Although the concept of health-related quality of life has gained increased attention within the area of health care in recent years, relatively little research has been carried out on the quality of life of patients post-MI

specifically. It is important to investigate health related quality of life as it has been shown to influence morbidity and mortality in cardiac patients. Indeed, Rumsfeld et al (1999) reported that patients with poorer self-perceived physical health had a greater mortality rate at 6 months. In the present study, quality of life was assessed using the MacNew. This is a particularly useful measure for the current study as it is a heart disease specific instrument.

A longitudinal study by Brink et al (2002) investigated quality of life in MI patients. They compared MI patients with normative data of people who had not had an MI. The MI patients reported poorer quality of life in both physical and mental health domains at 5 months. Deficits were particularly marked in areas of limitations due to physical problems, for example, work and other daily activities, and limitations due to emotional problems. In addition, women reported significantly poorer quality of life than men, experiencing significantly poorer physical health and more bodily pain. Gender differences were also reported in a study by Wiklund et al (1993) in which women reported greater problems in social functioning compared to men.

Further evidence relating to the importance of the concept of quality of life comes from a qualitative study by Roebuck et al (2001) who interviewed patients following an MI. Patients reported that the area of life they were most concerned about was their physical symptoms and their effect on everyday life. They also reported that their inability to perform basic activities such as shopping, or gardening were as distressing as the symptoms themselves.

Much of the research which has sought to investigate predictors of quality of life in cardiac patients has focussed on the impact of depression and anxiety. For example, Lane et al (2001) sought to examine the impact of symptoms of depression and anxiety on mortality and quality of life in MI patients. Their findings demonstrated that poorer quality of life at 12 months was predicted by greater baseline levels of depression, greater severity of infarction, living alone, and state anxiety. An earlier study by Mayou et al (2000) also reported that greater baseline levels of anxiety and depression among MI patients assessed within the first 72 hours after hospital admission predicted poorer quality of life at 1 year. More recently, Dickens et al (2006) reported that depression and anxiety assessed 6 months after MI predicted subsequent impairment on physical aspects of quality of life. Further support for the role of depression in quality of life can be seen in a recent review by Stafford et al (2007). They reviewed studies relating to the impact of depression on quality of life in patients with CHD, and reported that depressive symptoms predict quality of life even after successful medical and surgical treatment.

Further evidence on the importance of assessing quality of life in MI patients comes from a study undertaken by Brink, Karlson & Hallberg (2002). They reported that coping strategies, depression, and health complaints were associated with both physical and mental health 5 months post-MI. The relationship between illness perceptions and quality of life in MI patients has also been investigated. French et al (2005) reported that illness perceptions predicted emotional, physical and social quality of life, with beliefs about consequences being most strongly related. In addition, these relationships remained after controlling for anxiety and depression.

Further predictors of quality of life in cardiac patients have been identified by Joekes, Van Eldern & Schreurs (2007) who reported that both self-efficacy and perceived overprotection are associated with lowered quality of life in patients suffering from CHF or MI. In addition, Boersma et al (2006) found that self-efficacy with regards to goal attainment was an independent predictor of physical and social quality of life in MI patients.

Type D personality has also been investigated as a predictor of quality of life in cardiac patients. Al Ruzzeh et al (2005) assessed quality of life at 1 year after CABG and found that Type D was the best predictor of quality of life, with Type D patients being more than twice as likely to have poor physical quality of life, and more than 5 times as likely to have poor mental quality of life.

As outlined above a number of predictors of quality of life have been identified, most noticeably anxiety and depression. However, it is important to further examine other predictors of quality of life in MI patients. The current study aims to extend the findings relating to illness perceptions, Type D personality, depression and anxiety and also aims to determine the utility of prospective thinking, locus of control and role and goal investment in predicting quality of life post-MI.

8.1.3 Functional Outcome post-MI

Related to the idea of quality of life is functional outcome. However, it is important to acknowledge that while quality of life refers to satisfaction, functional outcome refers to actual disability, i.e. what you can and cannot do. In the present study, the measure of functional outcome used in the current study is an abbreviated version of the

widely used Sickness Impact Profile (SIP; De Bruin et al, 1992). It has also been conceptualised in a number of studies as a measure of disability post-MI (e.g. Petrie et al, 1996). The difficulties patients face after leaving hospital in terms of changing their lifestyle and regaining their vocational, sexual, and other functioning may be considerable. Indeed, functional disability post-MI is generally associated with higher levels of reported symptoms and lower levels of well-being (Brown et al, 1999).

As with the research carried out in the area of quality of life post-MI, most of the research to have focussed on functional limitations or disability post-MI has examined the role of depression and anxiety. For example, Mayou et al (2000) found that patients who were scored as probable cases of depression and anxiety exhibited significantly poorer functioning on specific measures of everyday activity compared to probable non-cases. In addition, a study by de Jonge et al (2006) also investigated predictors of disability post-MI. They found that patients with post-MI depressive disorder experienced more disability at 12 months post-MI.

Petrie et al (1996) investigated the relationship between illness perceptions and disability in post-MI patients. They found that patients' beliefs that their heart disease would have serious consequences were significantly related to later disability in work, around the house, recreational activities, and social interaction. In addition, a strong illness identity was significantly related to greater sexual dysfunction at both 3 and 6 months post-MI. In addition, Petrie et al (2002) found that a randomised controlled trial designed to change patients' illness perceptions was effective in increasing return to work.

Given the importance of patient functional outcome post-MI, the current study aims to determine the utility of personality and cognitive variables to predict functioning across four key areas; ambulation, mobility, recreation and social interaction.

8.1.4 Adherence in MI Patients

As outlined in Chapter 2 (see section 2.2.3), adherence to prescribed medication for patients diagnosed with an MI is crucial. Evidence from a number of drug trials has shown that medications such as beta-blockers, cholesterol lowering medication and aspirin significantly reduce mortality and morbidity rates (e.g. Chalmers et al, 2004; Sacks et al, 1996). Indeed, in a review from McDermott et al (1997), greater adherence to medication was found to be related to lower hospital readmission rates and improved outcomes in patients with or at risk for CHD. In addition, findings from the Beta-blocker Heart Attack trial demonstrated that poor adherers (who took 75% or less of prescribed medication) were 2.6 times more likely than good adherers to die within a year of follow-up (Horwitz et al, 1990).

Although there has been relatively little research on medication adherence in MI patients specifically, research has examined other adherence-related behaviours in cardiac patients. For example, there has been considerable interest in predictors of attendance at cardiac rehabilitation, and modifying lifestyle to incorporate health related behaviours in line with medical advice. There is considerable evidence to suggest the beneficial effects for patients in attending a cardiac rehabilitation programme, with meta-analyses suggesting a reduction in total mortality of around 20% among those who attend rehabilitation programmes (Thompson & Lewin, 2000). Indeed, one recent Cochrane review reported a 26% reduction in cardiac mortality as

a result of rehabilitation (Jolliffe et al, 2004). Despite this, only around one quarter to one third of MI patients attend rehabilitation classes (Jackson et al, 2005).

Patients give various reasons for non-attendance, these include, not wishing to attend, returning to work, the presence of comorbid health problems, and living too far away (Lane et al, 2001). A study by Cooper et al (1999) also reported that non-attenders were likely to be older, have a lower level of income, less likely to be employed and more likely to deny the severity of their illness. A further study by Melville et al (1999) reported that predictors of non-attendance included greater social deprivation, and previous history of MI. In contrast, factors that predicted attendance included younger age, male gender, and admission to a coronary care unit. Social support has also been established as a predictor of adherence to medical advice and attendance at rehabilitation programmes in cardiac patients (Krantz & McCeney, 2002). More recently, Cooper et al (2007) sought to develop a measure of patients' beliefs regarding cardiac rehabilitation. In doing so they identified four subscales which accounted for 65% of the variance in rehabilitation. They were; perceived necessity of rehabilitation, concerns about exercise, practical barriers, and perceived personal suitability. They also reported that patients were more likely to attend if they believed that rehabilitation was necessary and if they understood its role better, compared to non-attenders.

Patients' illness perceptions relating to their illness have also been examined extensively in relation to adherence behaviour, particularly with regards to attendance at rehabilitation. For example, Petrie et al (1996) examined the illness perceptions of a prospective study of MI patients. They reported that attendance at cardiac

rehabilitation was significantly related to a stronger belief at admission that the illness could be cured or controlled. Similarly, Cooper et al (1999) reported that patients who believed that their heart problems could be cured or controlled and patients who attributed the cause of their heart attack to lifestyle factors were more likely to attend rehabilitation.

A further study by Whitmarsh et al (2003) reported that those attending rehabilitation perceived a greater number of symptoms and consequences than poor/non-attenders. In addition, patients who had stronger beliefs that the illness was controllable or curable were more likely to attend. Attenders also experienced significantly higher rates of distress compared to non-attenders. More recently, in the largest study published to date investigating illness perceptions and attendance, French et al (2005) also investigated the relationship between illness perceptions and attendance. However, in contrast to previous studies, they found no significant associations between illness perceptions and attendance.

Prompted by the inconsistent findings relating to illness perceptions and attendance, French, Cooper & Weinman (2006) carried out a systematic review with meta-analysis of the available literature. They identified that cardiac rehabilitation was predicted by four components of illness perceptions: patients with more positive identity, cure/control, consequences, and coherence. However, these effects all corresponded to small effect sizes. Therefore, this study does provide some support for the role of illness perceptions in predicting adherence. It also points to the fact that further research is needed to examine how illness perceptions develop from the point

of admittance as the time at which illness perceptions were measured was identified to be a key moderating factor.

A further study from Cooper et al (2005), this time employing a qualitative approach, also found that patient beliefs may act as a barrier to attendance. They identified five key themes following interviews with thirteen MI patients. They were; content of the course, perceived benefits, explicit barriers to attendance, cardiac knowledge, and the nature of the patients' CHD.

With regards to lifestyle changes, Weinman et al (2000) investigated the effects of causal attributions and subsequent lifestyle changes in a prospective study of first time MI patients and their spouses. They reported that patients' and their spouse's beliefs about the cause of their MI affected adherence to healthy lifestyle changes. Specifically, patients who believed that their MI was caused by unhealthy lifestyle behaviours were more likely to have made dietary changes at 6 month follow-up. In addition, spouse attributions that poor health habits were associated with their partner's MI were associated with improvement in the patients' level of exercise. However, French et al (2005) carried out a re-analysis of the data, taking into account pre-MI behaviour. They found that once this was controlled for there was no relationship between causal attributions and subsequent behaviour change.

Byrne, Walsh & Murphy (2005) investigated the relationship between illness perceptions and CHD patients' secondary preventive behaviour. This is the one of few studies to-date which has investigated the relationship between illness perceptions and medication in cardiac patients specifically. They reported only a weak association

between illness perceptions and preventive behaviour, and a small-to-medium relationship between medication beliefs and adherence to medication. However, medication adherence were predicted more strongly by specific medication beliefs. A stronger belief in the necessity of medication and fewer concerns about medication was predictive of higher adherence to medication.

Further research on medication adherence has investigated the role of depression. For example, Carney et al (1995) found that elderly patients suffering from depression and CHD were less likely to adhere to prescribed aspirin therapy when compared to non-depressed patients. Research has also been conducted to determine the relationship between quality of life, adherence and depression. Fogel et al (2004) examined whether quality of life predicted adherence, independent of depression after 4 months post-MI. They reported that quality of life on the physical health domain was related to adherence, even after controlling for the effects of depression.

Given the central role of medication adherence in the prognosis of MI patients, it is vital to identify robust predictors of adherence. In addition, little research has been carried out to investigate the role of illness perceptions and specific medication beliefs in MI patients. A similar approach has met with success in predicting nonadherence to preventer medication in asthma patients (Horne & Weinman, 2002). In this study, Leventhal's self regulation model was extended to include medication beliefs (see section 2.2.3). Indeed, it has been suggested that the ability of the self-regulation model to explain treatment adherence may be improved by the inclusion of specific treatment or medication beliefs into the model (Horne, 1997).

Horne & Weinman (2002) reported that non-adherence was associated with doubts about the necessity for the medication to maintain health and with concerns about the potential adverse effects of the medication. In addition, illness perceptions were also found to be substantial independent predictors of adherence. These findings therefore lend support to an extended self-regulatory model of treatment adherence, which incorporates beliefs about treatment as well as illness perceptions. A previous study by Horne and Weinman (1999) had investigated medication beliefs in four different illness groups, including cardiac patients. They found that many patients engage in an implicit cost-benefit analysis in relation to medication adherence where beliefs about the necessity of medication are weighed against concerns about its potential adverse effects.

The current study will, therefore, aim to identify further predictors of medication adherence in MI patients. In particular, the role of illness perceptions and medication beliefs will be investigated as no study has utilised this approach specifically with MI patients. In addition, the role of depression and anxiety in predicting adherence will be further examined. It is also important to determine if there is a relationship between personality and medication adherence, and if so, how this relationship manifests itself. Indeed, Type D's toxic effect on outcome could be explained via poor adherence.

8.1.4 Benefit Finding post-MI

Although the majority of research carried out on patient outcome following illness concentrates on negative consequences, such as a reduction in quality of life, more recently there has been increased interest in examining potential positive

consequences. For example, patients with a wide variety of medical problems report benefits or gains from their adversity, such as, the strengthening of relationships, and a change in life's priorities and personal goals (e.g. Affleck et al, 1987; Pakenham, 2005).

The majority of research into benefit finding has been carried out with cancer patients. For example, Carver & Antoni (2004) investigated benefit finding in breast cancer patients in the year following surgery. These patients were then followed-up between 5 and 8 years later, it was found that benefit finding reported initially, predicted more positive emotion and self-judged quality of life and lower distress and depression at follow-up. Furthermore, higher benefit finding predicted lower distress and depression even after controlling for initial levels of these variables. In addition, recent intervention programmes are now aiming to improve benefit finding among patients as an important factor in the psychological adjustment of cancer patients (e.g. Cameron et al, 2007). However, findings relating to benefit finding in cancer patients are not entirely consistent. Indeed, Tomich & Helgeson (2004) reported that benefit finding was associated with increased negative affect, and worse mental functioning in breast cancer patients at 4-6 months post diagnosis. The authors suggest that benefit finding may signal a reluctance to recognise the severity of one's diagnosis, thus it may be one way to reduce the threat of negative information. If benefit finding signals denial then it may be maladaptive over time as it may interfere with coping strategies.

Relatively little research has examined the role of benefit finding in cardiac patients. However, Petrie et al (1999) have carried out a study which examined the positive effects of illness in both MI and breast cancer patients. They assessed MI patients in

hospital and breast cancer patients on referral for radiotherapy, and again 3 months later. At 3-month follow-up, the patients were asked to report any positive changes that had taken place in their lives following their illness. Approximately 60% of each patient group reported positive changes from their illness, for MI patients the most common theme reported was healthy lifestyle change. In addition, the reporting of positive experiences was unrelated to illness severity.

An earlier study by Laerum et al (1987) found that one third of MI patients reported positive changes in their lives at 4-months post-MI, the most common theme reported in this study was an improved feeling of closeness to their immediate family. Prior to this, Affleck et al (1987) interviewed nearly 300 MI patients at 7 weeks and 8 years post-MI. They found that patients who reported benefits relating to their MI at 7 weeks were less likely to have had another infarction, and had lower levels of morbidity at 8 year follow-up. More recently, Sheikh (2004) investigated the relationship between personality, social support, and coping and posttraumatic growth in the context of heart disease. They found that extraversion was the most significant predictor of posttraumatic growth, and that problem-focused coping partially mediates this relationship. In addition, they found no relationship between social support and posttraumatic growth.

Due to the lack of research that has examined the role of benefit finding in MI patients, and the promising findings in the three studies that have been carried out, the current study will examine further the role of benefit finding in MI patients. Specifically, it will test for predictors of benefit finding in post-MI patients.

8.1.5 Aims

Within the broader context of identifying predictors of outcome post-MI, the current study primarily examines the role of personality, and mechanisms by which personality may lead to adverse psychological outcome. Personality in the current study is assessed by both Type D personality and optimism, two distal risk factors for adverse outcome in post-MI patients. It is important to identify; (i) if personality is predictive of outcome after controlling for clinical and sociodemographic variables; (ii) to determine if any relationship observed between personality and outcome can be explained by mood, and (ii) how the relationship between personality and outcome manifests itself, in other words, to determine the mechanisms by which personality may influence health. Proximal risk factors, such as, illness perceptions, future thinking and locus of control will be investigated as possible bridges between personality and adverse psychological outcome in post-MI patients.

In summary, the current study has four key aims:

(1) To investigate the prevalence of Type D personality in a clinical sample, and the relationship between Type D and each of the variables under investigation (illness perceptions, locus of control, future thinking, role and goal investment, optimism, mood, medication beliefs, adherence, quality of life, functional outcome, benefit finding).

(2) To investigate if personality predicts outcome after controlling for clinical and demographic variables.

(3) To determine if personality predicts outcome after controlling for mood.

(4) To identify the mechanisms by which personality is associated with adverse psychological outcome.

8.2 Method

8.2.1 Participants and Procedure

Patients were recruited from the Cardiology ward of the Royal Infirmary of Edinburgh following an MI. Their psychological wellbeing was assessed 3-7 days post-MI and again three months later. Two hundred and five patients were recruited to the study. Exclusions were limited to participants who were unfit for interview, unable to give informed consent or unable to understand English. It is not possible to determine if the sample recruited is representative of all MI patients being admitted to the ward as this information was not available from the hospital. Ninety-six percent of patients who were approached agreed to take part. Only 8 potential participants who were approached declined to take part. There were 59 females and 146 males with an overall mean age of 66.03 years (SD=10.7, range=40-88) in the sample at Time 1. The men (M=66.42; SD=10.83) and women (M=65.05; SD=10.78) did not differ significantly in terms of age (t (1, 203) =0.781, ns). Sixty-four of the participants (31%) had experienced an MI previously.

Potential participants were approached in the cardiology ward and invited to participate in the study. A brief introduction outlining the nature of the study assessment was given, it was also highlighted that participation was voluntary, confidential and that refusal would not interfere with their treatment protocol. Ethical approval had been obtained from the Local Research Ethics Committee and the University Department of Psychology. At this stage, all patients invited to participate were given a patient information sheet (see Appendix 21), which explained the rationale for the study, implications of their participation and specified the main

investigators involved. Those who agreed to participate were then asked to give written consent (see Appendix 22).

At Time 1, 3-7 days post-MI (M=4.32 days, SD=1.14) patients were interviewed in hospital. The future thinking task was always administered first to reduce contamination effects, followed by measures of Type D personality, optimism, locus of control, illness perceptions, mood (i.e., anxiety and depression), health-related behaviour and views on medicines, but the order of presentation of these measures was counterbalanced.

Of the 205 patients recruited at time 1, 131 went on to complete the Time 2 measures, representing a 62.6% follow-up rate (which is comparable to other studies with this population, e.g. Mayou et al, 2000). A flow-chart of the sample size and retention rate at each stage of the study is given in Figure 8.1. Fourteen participants (6.8%) were excluded as they had missing data on an entire self-report measure, 3 participants (1.46%) died between Time 1 and Time 2, 19 participants (9.27%) could not be contacted at Time 2, and 38 participants (18.53%) declined to participate at Time 2. Those who completed the Time 2 measures, and those who did not, were not significantly different in terms of age (t (1, 203) =0.621, ns), gender (χ^2 (2, N=205) =6.59, ns), deprivation category (χ^2 (7, N=205) =5.34, ns) or MI severity as assessed by left ventricular functioning (χ^2 (4, N=205) =3.75, ns).

At time 2, on average 3 months later (M=13.63 weeks, SD=2.86), patients were contacted again via telephone and asked to complete measures of quality of life, functional outcome, benefit finding, medication adherence, role and goal investment,

Type D personality, health-related behaviour, and views of medication. The order of

presentation of the measures was counterbalanced to control for transfer effects.

Total number of patients at Time 1 — n= 205

Excluded due to missing

data on self-report measures — n= 14

Died between hospitalisation

and 3 months follow-up — n=3

Could not be contacted at

3 months follow-up — n= 19

Declined to participate at

3 months follow-up — n= 38

Included patients at Time 2 — n= 131
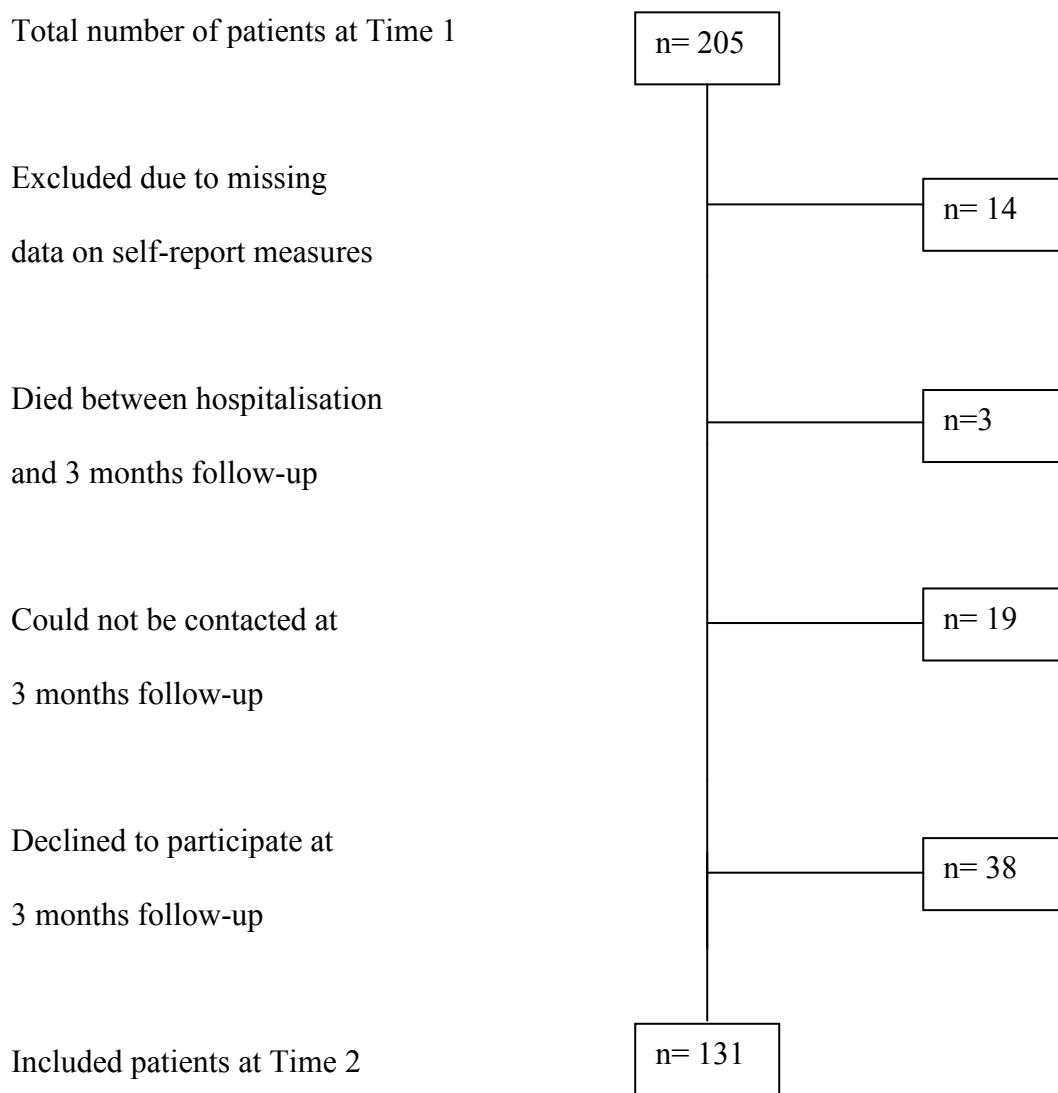
Figure 8.1: Flowchart of sample size and retention rate at each stage of the study

<u>8.2.2 Measures</u>

<u>8.2.2.1 Demographic Information</u>

Socio-demographic variables included gender, age socioeconomic status, and smoking status. Socioeconomic status was measured by the deprivation scores attached to an individual's postal code (Carstairs & Morris, 2001). This is a well-established measure of socio-economic status in Scotland. It ranges from a deprivation category (DEPCAT) of 1=most affluent postcode sectors, to DEPCAT 7=most deprived. The Carstairs and Morris index was originally developed in the 1980s using 1981 census data. It is composed of 4 indicators at postcode sector level that are judged to represent material disadvantage in the population (lack of car ownership, National Statistics Socio-economic Classification, overcrowded households and male unemployment). The index used in the current study is based on 2001 census data.

<u>8.2.2.2 Clinical Variables</u>

Baseline clinical variables, including history of previous MI, creatine kinase level, troponin level, and left ventricular functioning (LVF) were obtained from patients' hospital records. LVF was measured by means of echocardiography.

8.2.2.2.1 Cardiac Enzymes

Creatine kinase (CK) and troponin are cardiac enzymes that are measured through blood tests to determine if an MI has occurred, and the resulting damage to muscle and heart cells. During the process of muscle damage, muscle cells break open and their contents find their way into the bloodstream, because most of the CK in the body normally exists in muscle, a rise in the amount of CK in the blood indicates that

muscle damage has occurred, or is occurring. Higher amounts of serum CK indicate acute muscle injury. Cardiac troponin is the most specific and sensitive laboratory marker of myocardial cell injury. Certain subtypes of troponin (cardiac troponin I and T) are very sensitive and specific indicators of damage to the heart muscle. A patient who had suffered from a MI would have an area of damaged heart muscle and so would have elevated cardiac troponin levels in the blood. A meta-analysis carried out by Heidenreich et al (2001) demonstrated that troponin has good prognostic value in patients with acute coronary syndromes.

8.2.2.2.2 Left Ventricular Functioning

The main measure of MI severity used in the current study is LVF which assesses the functioning of the heart's left ventricle. LVF measurements are taken during echocardiogram. The echocardiogram report then outlines whether LVF is normal, mildly impaired, moderately impaired, or severely impaired. Sixteen patients (8.3%) did not have an echocardiographic examination as they were assumed to have suffered a mild MI with no cardiac damage. This was confirmed by examining their cardiac enzyme scores. Low values of cardiac enzymes (troponin <5, CK<500) have been found to correlate with good LV function (Rao et al, 1998). All participants without an echo were found to be below these recommended cut-off points for both cardiac enzyme scores and so were deemed to have normal LVF.

8.2.2.3 Baseline Measures

As full details of each of the following measures have been provided in Chapter 4, the measures are described only briefly here.

8.2.2.3.1 Future Thinking

The future thinking task (FTT; MacLeod et al, 1997) was used to assess prospective thinking (see Appendix 5). It requires participants to generate potential future experiences (both positive and negative) across three time periods in the future; the next week, the next year and the next five to ten years.

8.2.2.3.2 Type D Personality

The Type D Personality Scale (DS14; Denollet, 2005) is a 14-item scale comprising of 2 subscales (see Appendix 1). A 7-item subscale which measures negative affectivity and a 7-item subscale measuring social inhibition. Cronbach's α=0.88 and 0.86 respectively for NA and SI indicating excellent internal consistency in the current sample.

8.2.2.3.3 Optimism

Optimism/ Pessimism was assessed by the Life Orientation Task-Revised (LOT-R; Scheier, Carver & Bridges, 1994) (Appendix 6). This is a 10-item scale including three positively worded items, three negatively worded items, and four filler items. Participants are asked to indicate their agreement with these statements on a 5-point scale ranging from 'I agree a lot' to 'I disagree a lot'. Cronbach's α=0.88 demonstrating good internal consistency in the current sample.

8.2.2.3.4 Depression and Anxiety

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item self-report measure designed to assess depression and anxiety (see Appendix 12). It contains two subscales, one 7-item scale relating to depression, and one 7-item

subscale relating to anxiety. Items are rated on a 0-3 point scale indicating strength of agreement with each item. Internal consistency was good for both the depression and anxiety subscales with α=0.90 and α=0.91 respectively.

8.2.2.3.5 Locus of Control

The Recovery Locus of Control Scale (RLOC; Partridge & Johnson, 1989) is a 9-item scale developed to measure the internality/externality of an individual's perceptions of control over their recovery (see Appendix 7). Five items reflect internal beliefs, and four items are worded to reflect external beliefs. Participants are asked to indicate their level of agreement with each item using a five-point Likert-type scale from 1 ('strongly agree') to 5 ('strongly disagree'). Internal consistency was good in the current study (Cronbach's α=0.90).

8.2.2.3.6 Health-Related Behaviour

A brief version of the GPHB was employed; this was done in order to reduce response burden. The Brief GPHB is an 8-item measure (see Appendix 14). These items were selected as being the eight preventive health behaviours on which groups of respondents who were found to be in 'very good', 'good' and 'average to very poor' health following medical assessment significantly differed (Amir, 1987). Cronbach's α is not calculated as the items are not intended to be a scale.

8.2.2.3.7 Illness Perceptions

The Brief Illness Perception Questionnaire (Brief IPQ; Broadbent et al, 2006) is a 9-item scale designed to quickly assess the key cognitive and emotional representations of illness (see Appendix 9). Five of the items assess cognitive illness representations:

consequences, timeline, personal control, treatment control, and identity. Two of the items assess emotional representations: concern and emotions. One item assesses illness comprehensibility. All of these items are rated using a 0-10 response scale. No cronbach's α is computed for this measure because each item corresponds to a different illness representation.

8.2.2.3.8 Beliefs about Medicines – General

The Beliefs about Medicines Questionnaire (BMQ; Horne, Weinman & Hankins, 1999) assesses cognitive representations of medication (Appendix 8). The BMQ-General assesses beliefs about medicines in general. It comprises two scales, consisting of 4-items each. The general-overuse scale assesses views about the way in which medicines are used by doctors and assesses personal beliefs about the extent to which doctors place too much trust in medicines. The general-harm scale assesses beliefs about the intrinsic properties of medicines and the degree to which they are perceived by the individual as being harmful. Respondents indicate their level of agreement with each statement on a 5-point Likert-type scale, ranging from 1=strongly disagree to 5=strongly agree. Cronbach's α= 0.83 and 0.64 for the overuse and harm scales respectively, demonstrating acceptable internal consistency.

8.2.2.4 Follow-up Measures

Participants again completed measures of Type D personality (NA-T2; α=0.73; SI-T2; α=0.78), health-related behaviour, depression and anxiety (Depression-T2; α=0.91, Anxiety-T2; α=0.83). In addition, participants completed the following measures:

8.2.2.4.1 Quality of Life

Quality of life after myocardial infarction was assessed using the MacNew (Lim et al, 1993; Valenti et al, 1996) (Appendix 18). This is a heart disease specific health-related quality of life health-related quality of life instrument which assesses three major domains: emotional, physical, and social. The instrument consists of 27 items, each with a seven-point Likert-type response scale. Cronbach's α=0.95 for the overall measure, indicating excellent internal consistency. In addition α=0.95, 0.94, and 0.94 for the emotional, social, and physical domains, respectively.

8.2.4.4.2 Functional Outcome

The Functional Limitations Profile (FLP; Patrick & Peach, 1989) aims to assess changes in function due to ill-health (see Appendix 19). The scale consists of 136 items within 12 categories of activity. Four categories were selected for use in the current study. These were ambulation, mobility, recreation and social interaction. Each category contains items which describe a restriction in activity and the respondents are required to indicate whether the item applied to the today and if it is due to their health. Administration of the FLP was modified for use in the current study. Participants were asked whether they agreed or disagreed with each statement. If they agreed, they were asked; 'Is this due to your health?' If the participant answered yes then they moved on to the next category of items. Cronbach's α=0.81 for the composite score from the 4 abbreviated FLP scales indicating good internal consistency in the current sample.

8.2.4.4.3 Medication Adherence

The Medication Adherence Report Scale (MARS; Horne, Weinamn & Hankins, 1999) was developed to measure adherence to a wide-range of medication regimes (see Appendix 20). It assesses how often patients have been non-adherent, by assessing various non-adherent behaviours. The 5-item scale asks respondents to rate the frequency with which they engage in each of five aspects of non-adherent behaviour, for example 'I forget to take them' on a five point scale (5=never; 4=rarely; 3=sometimes; 2=often; 1=very often). Internal consistency for the MARS was excellent in the current study, α=0.92.

8.2.4.4.4 Benefit Finding

Benefit finding was measured using a 17-item measure developed by Urcuyo, Boyers, Carver & Antoni (2005) (Appendix 17). The measure used the stem 'Having had a heart attack…' and each item continued by mentioning a potential positive contribution to the respondent's life that might plausibly follow from their experience of having a heart attack. Respondents rate their level of agreement with each item on a 4-point scale ranging from 'I disagree a lot' to 'I agree a lot'. Cronbach's α=0.93 indicating excellent internal consistency in the current sample.

8.2.4.4.5 Role and Goal Investment

The Roles and Goals Questionnaire (RAG; Lam & Power, 1991) assesses an individual's roles and goals across four domains (see Appendix 10). (1) present work; (2) the most important interests and hobbies; (3) the most important personal relationships; and (4) health and independent living. Internal consistency of the measure was good in the present sample, with α=0.88.

8.2.4.4.6 Beliefs about Medicines – Specific

The Beliefs about Medicines Questionnaire (BMQ; Horne, Weinman & Hankins, 1999) assesses cognitive representations of medication (see Appendix 8). The BMQ comprises two sections. The BMQ-Specific comprises two scales, one 5-item scale which assesses personal beliefs about the necessity of prescribed medication for controlling their illness and another 5-item scale which assesses concerns about the potential adverse effects of taking the medication. Respondents indicate their level of agreement with each statement on a 5-point Likert-type scale, ranging from 1=strongly disagree to 5=strongly agree. Internal consistency was good for both the concerns and necessity subscales, cronbach's α=0.69 and 0.93 respectively.

8.2.5 Statistical Analyses

G-Power for multiple regression (Faul, Erdfelder, Lang & Buchner, 2007) was conducted prior to data collection in order to determine the sample size required at follow-up to be statistically significant. In order to detect a medium effect size of 0.15, with alpha at .05, power at .80, a sample size of 131 participants at time 2 allows us to use 13 predictors (the maximum number of predictors that will be used in a single regression analysis).

First, the baseline demographic and clinical characteristics of the sample are described. Then correlations, means and standard deviations (SD's) are presented for each of the outcome and predictor variables from T1 and T2. A series of hierarchical multiple regression analyses are then presented in order to identify the best predictors of each

outcome variable: quality of life (emotional, physical and social), functional outcome, medication adherence, benefit finding, T2 depression, and T2 anxiety.

The order by which variables were entered into the regression analyses was determined as follows. Sociodemographic variables were entered in the first step as these are fixed entities. Clinical variables were entered next as it is important to determine of any of the psychological variables that are entered subsequently explain outcome over and above clinical variables. The personality variables (i.e. Type D and optimism) were entered next as they are relatively stable trait-like factors while all of the remaining factors are states. In addition, as it is of primary interest to investigate possible mediators of the relationship between personality and outcome, the remaining variables were entered after personality. At the next step illness perceptions are entered as we are testing the utility of the SRM. The remaining variables were selected if they were significantly correlated with the outcome variable in question. The order in which these remaining variables were entered was determined based on the strength of their relationship with the outcome variable as demonstrated by previous research. Variables that are known to be stronger predictors were entered higher up the equation.

If the regression analyses suggest that mediation has taken place then formal tests of mediation were conducted following the procedure outlined by Baron and Kenny (1986). According to Kenny et al. (1998), mediation is demonstrated when the following conditions are met: (1) the independent variable (e.g., Type D) affects the mediator (e.g., illness perceptions); (2) the independent variable affects the dependent variable (e.g., quality of life); (3) the mediator affects the dependent variable when the

independent variable is controlled for and; (4) full mediation is confirmed when the association between the independent variable and dependent variable is reduced to non-significance after the effect of the mediator is controlled for. If conditions 1-3 are met partial mediation is indicated. Sobel tests were also conducted in each case in order to determine if there had been a significant reduction in the relationship between the dependent and independent variables.

8.3 Results

8.3.1 Baseline Characteristics of Patients

The baseline characteristics for the 192 participants (the 14 participants with missing data had been excluded at this stage) are as follows: The mean age of the participants was 66.0 (10.8) years (range 40-88 years). Women comprised 28.1% of the sample (n=54). The mode for deprivation category for the sample was 4. With regards to the baseline clinical data, 52 patients (27%) had experienced an MI previously, 58.9% of patients (n=113) had normal left ventricle functioning, 24.5% (n=47) had mild impairment, 11.5% (n=22) had moderate impairment, and 5.2% (n=10) had severe impairment. Sixty-two patients (32%) were currently smokers.

In order to determine probable clinical caseness of anxiety and depression in the current sample, the following recommended cut-off points were used (Zigmond & Snaith, 1983). On the HADS subscales, individuals are classified as normal if they score 0-7, borderline if they score 8-10, with scores of 11-21 representing 'caseness'. Therefore, in the current sample 39 (20.3%) patients scored in the 'caseness' range of anxiety, and another 12 (6.2%) scored as borderline cases of anxiety. For depression,

31 (16.1%) scored in the range of 'caseness', while 13 (6.8%) scored as borderline cases.

8.3.2 Type D Personality Analysis

From the sample of 192 participants, 65 (18 females and 47 males) were classified as Type D (33.9%) by using the recommended cut off point of ≥ 10 on both NA (M=11.43; SD=5.87) and SI (M=10.85; SD=5.73) sub-scales. This corresponds to 33.3% of females and 36.1% of males being categorised as having a Type D personality. There was no effect of gender on Type D status, χ^2 (1, N=192)=0.009, ns. Z-tests for the equality between two proportions revealed that the prevalence rate observed in the current sample is not significantly higher (z=1.4, ns) than that found in the Dutch sample that was used to validate the DS14 (Denollet, 2005). In addition, the rate established in the current study is not significantly different to that found in the non-clinical sample in Chapter 4 (z=-1.57, ns). The stability of the Type D construct was found to be good (k=0.69), with 86.4% classified in the same way on both occasions.

A MANOVA was carried out to examine differences between Type D and non-Type D individuals in each of the variables under investigation (see Table 8.1), gender was also entered as a factor. It was found that Type D individuals experience significantly higher levels of depression and anxiety compared to non-Type D individuals, Type D individuals have significantly lower levels of optimism compared to non-Type D's. In addition, Type D's also scored significantly lower on the measure of locus of control, indicating that they believe their recovery is less controllable by them, compared to non-Type D's.

With regards to illness perceptions, Type D individuals believe that their illness has significantly more serious consequences, will last significantly longer, will be significantly less controllable by them or through treatment compared to non-Type D patients, and experience significantly more symptoms that they attribute to their illness. In addition, they are significantly more concerned about their illness, experience significantly more emotions as a result, and find their illness to be significantly less comprehensible compared to non-Type D individuals. Importantly, this demonstrates that all illness perceptions are different in Type D individuals.

When looking at views on medications, Type D individuals believe their medication to be significantly less necessary compared to non-Type D individuals. However, there were no differences between Type D and non-Type D individuals in how concerned they were about their medication.

For future thinking, Type D individuals generated significantly fewer positive future events compared to non-Type D's. In addition, they generated significantly more negative future events compared to the non-Type D patients. However, there were no significant differences on role and goal investment between the two groups.

Type D and non-Type D individuals were also compared across each of the main outcome measures. It was found that Type D individuals had significantly lower levels of quality of life, were significantly more functionally impaired, and were significantly less adherent to medication compared to non-Type D individuals. There were no differences between Type D and non-Type D individuals on benefit finding.

In the interest of completeness it should be noted that there was no significant effect of gender on any of these variables. In addition, there were no Type D x gender interations. Therefore, for ease of presentation Table 8.1 only shows the analysis for Type D and non-Type D individuals.

Table 8.1 Patient characteristics as a function of Type D personality

Variable	Type D	Non-Type D	F	p
Depression	10.93 (5.87)	4.83 (3.7)	51.16	p<.001
Anxiety	10.32 (5.21)	5.22 (3.11)	56.85	p<.001
Optimism	16.11 (4.18)	23.5 (3.03)	57.42	p<.001
Recovery Locus of Control	33.48 (6.68)	38.53 (3.88)	54.76	p<.001
Consequences	8.03 (0.9)	6.07 (1.11)	50.64	p<.001
Timeline	7.92 (1.17)	6.43 (1.45)	50.97	p<.001
Personal Control	5.67 (0.92)	6.39 (1.97)	7.71	p<.05
Treatment Control	6.43 (1.49)	7.79 (1.58)	33.31	p<.001
Identity	6.6 (1.15)	4.89 (1.88)	45.42	p<.001
Concern	7.77 (1.22)	7.04 (1.51)	11.11	p<.05
Emotions	7.58 (1.22)	5.64 (1.88)	57.1	p<.001
Comprehensibility	6.72 (0.65)	7.35 (1.21)	15.21	p<.001
Medication Necessity	14.37 (3.93)	16.84 (4.84)	8.86	p<.05
Medication Concerns	13.87 (3.05)	13.55 (2.71)	0.37	ns
Positive Future Thinking	10.92 (4.12)	13.44 (3.22)	20.95	p<.001
Negative Future Thinking	9.07 (2.11)	7.86 (2.5)	11.17	p<.05
Roles and Goals	2.95 (2.45)	2.99 (2.28)	0.1	ns
Quality of Life	86.41 (18.84)	122.16 (25.52)	69.61	p<.001
Functional Outcome	111.86 (29.01)	69.75 (29.49)	61.54	p<.001
Adherence	18.72 (5.12)	23.06 (1.94)	48.38	p<.001
Benefit Finding	36.78 (8.78)	40.23 (12.67)	2.7	ns

Chi-square analyses were then carried out in order to examine the differences between Type D and non-Type D individuals (see Table 8.2) on each of the health-related behaviours. It was found that Type D individuals are significantly less likely to eat sensibly or get enough sleep compared to non-Type D patients. In addition, Type D patients were found to be significantly more likely to be smokers compared to their non-Type D counterparts. However, no significant differences were found between Type D and non-Type D individuals on the following behaviours; spending time outdoors everyday, getting enough exercise, avoid letting things get me down, and get a regular medical check-up.

Table 8.2 Chi-square Analysis for Type D and Health-related Behaviour

| Health Behaviour | Type D | | Non-Type D | | χ^2 | p |
	Do not do or sometimes do	Always	Do not do or sometimes do	Always		
Eat Sensibly	27	38	25	102	10.4	p<.01
Get enough sleep	46	19	56	71	12.29	p<.001
Spend time outdoors everyday	26	39	44	83	0.53	ns
Do not smoke	45	20	20	107	54.92	p<.001
Get enough exercise	45	20	83	44	0.29	ns
Avoid letting things get me down	38	27	81	46	0.52	ns
Get a regular medical check-up	34	31	83	44	3.07	ns

8.3.3 Correlation Analysis

Correlations, means, and SD's were calculated for the outcomes and predictors. This was done in order to investigate the relationships between each of the variables. The following sections outline which variables were significantly associated with each of the outcome variables. Three separate correlation matrices are presented (due to space constraints). The first (Table 8.3) gives the correlations between the demographic and clinical data with each of the outcome variables. The second (Table 8.4) presents the correlations between the outcome variables and illness perceptions, and the third (Table 8.5) presents the correlations between the remaining predictor variables and outcomes.

8.3.3.1 Correlations between Demographic and Clinical Factors

From Table 8.3 it can be seen that age was positively correlated with deprivation, depression at time 2, and anxiety at time 2. Age was also associated with lower levels of adherence and quality of life. Gender was not found to be correlated with any of the outcome measures, while deprivation was negatively correlated with quality of life. Having a previous MI was also negatively correlated with quality of life, and benefit finding, and was associated with more functional impairment and anxiety at time 2. Greater left ventricular impairment was associated with lower quality of life.

8.3.3.2 Correlations between Illness Perceptions

Table 8.4 presents the correlations between the illness perceptions and the outcome variables. The belief that your illness would have more serious consequences was associated with poorer quality of life, and adherence. It was associated with greater functional impairment, and depression and anxiety at time 2. The perception that your

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illness would last for longer was associated with lower quality of life and benefit finding, and was associated with greater functional impairment and symptoms of depression and anxiety at time 2. The belief that your illness is personally controllable was not significantly correlated with any of the outcome variables. Believing that your illness could be controlled by treatment was associated with higher quality of life and adherence. It was related to greater functional impairment, and depression and anxiety at time 2. The perception of experiencing a greater number of symptoms from your illness was associated with greater functional impairment, and depression and anxiety at time 2. Being more concerned about your illness was not significantly associated with any of the outcome variables. Experiencing more negative emotions as a result of your illness was associated with poorer quality of life, and adherence. In addition, it was associated with higher depression and anxiety at time 2. Finally, understanding more about your illness was associated with lower depression at time 2.

8.3.3.3 Correlations between Remaining Predictor Variables

As shown in Table 8.5 all of the outcome variables (depression T2, anxiety T2, quality of life, adherence, functional outcome, benefit finding) were strongly intercorrelated. With regards to the predictor variables, depression and anxiety at time 1 were associated with lower adherence, quality of life, and benefit finding, and with greater depression and anxiety at time 2. Overinvestment in roles and goals was not associated with any of the outcome measures. Recovery locus of control was associated with greater adherence and quality of life. It was associated with lower functional impairment, and depression and anxiety at time 2. Optimism was associated with greater adherence, quality of life, and benefit finding. It was associated with lower functional impairment, and depression and anxiety at time 2.

Type D personality was associated with poorer adherence and quality of life. In addition, it was associated with greater functional impairment, and depression and anxiety at time 2. Positive future thinking was associated with higher adherence, quality of life, and benefit finding, and was associated with lower functional impairment, and depression and anxiety at time 2. Conversely, negative future thinking was associated with lower adherence and quality of life, and associated with higher depression and anxiety at time 2. A stronger belief in the necessity of medication was correlated with higher adherence, quality of life and benefit finding. It was associated with lower functional impairment, and depression and anxiety at time 2. Being more concerned about taking your medicines was associated with lower quality of life, and depression and anxiety at time 2.

Table 8.3 Correlations, Means and Standard Deviations of the Outcome Variables and the Demographic and Clinical Data

Variable	1	2	3	4	5	6	7	8	9	10	11
1.Age	–										
2. Gender	-.057	–									
3. DEPCAT	.177*	-.036	–								
4. Previous MI	-.030	-.016	.094	–							
5. LVF	.011	-.027	-.075	-.024	–						
6. Medication Adherence	-.190*	.033	-.164	-.107	-.160	–					
7. Quality of Life	-.201*	-.005	-.210*	-.256**	-.207**	.709**	–				
8. Functional Outcome	.170	-.010	.131	.216*	.121	-.349**	-.553**	–			
9. Depression T2	.232**	.033	.135	.162	.035	-.629**	-.416**	.396**	–		
10. Anxiety T2	.282**	.063	.093	.270**	.029	-.543**	-.536**	.552**	.857**	–	
11. Benefit Finding	-.067	.017	-.110	-2.11*	.026	.309**	.550**	-.285**	-.334**	-.515**	–

| Mean | 66.0 | – | 3.36 | – | 0.63 | 21.53 | 109.61 | 169.06 | 7.05 | 6.76 | 39.02 |
| SD | 10.8 | – | 1.51 | – | 0.88 | 3.98 | 28.94 | 71.00 | 5.39 | 4.76 | 11.55 |

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Table 8.4 Correlations, Means and Standard Deviations of the Outcome Variables and Illness Perceptions

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Consequences	–													
2. Timeline	.265**	–												
3. Personal control	-.112	.120	–											
4. Treatment control	-.411**	-.108	.011	–										
5. Identity	.409**	.138	.182*	-.561**	–									
6. Concern	.452**	.090	-.166*	-.012	.122	–								
7. Emotions	.405**	.136	-.203**	-.549**	.603**	.309**	–							
8. Comprehensibility	-.346**	.073	.201**	.400**	-.424**	.102	-.176*	–						
9. QoL	-.375**	-.441**	-.018	.217*	-.157	.111	-.173*	-.088	–					
10. Functional Outcome	.331**	.325**	-.030	-.303**	.229**	.020	.158	-.071	-.553**	–				
11. Adherence	-.403**	-.165	.098	.394**	-.370**	.124	-.367**	.170	.709**	-.349**	–			
12. Depression T2	.465**	.234**	-.135	-.679**	.571**	.114	.551**	-.195*	-.416**	.396**	-.629**	–		

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14
13. Anxiety T2	.307**	.334**	-.052	-.597**	.515**	.059	.445**	.014	-.536**	.552**	-.543**	.857**	—	
14. Benefit Finding	.011	-.206*	.087	.120	.044	.085	-.120	-.451**	.550**	-.285**	.309**	-.334	-.515**	—
Mean	6.73	6.94	6.15	7.33	5.47	7.29	6.29	7.14	109.61	169.06	21.53	7.05	6.76	39.02
SD	1.40	1.54	1.72	1.67	1.85	1.46	1.92	1.10	28.94	71.00	3.98	5.39	4.76	11.55

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Table 8.5 Correlations, Means and Standard Deviations of the Outcome Variables and Predictors

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Dep T1	–															
2. Anx T1	.810**	–														
3. Dep T2	.853**	.725**	–													
4. Anx T2	.753**	.800**	.857**	–												
5. RAG	.274**	-.210*	-.333**	-.303**	–											
6. RLOC	-.730**	-.636**	-.580**	-.467**	.063	–										
7. OPT	-.746**	-.676**	-.656**	-.620**	.142	.716**	–									
8. Type D	.665**	.704**	.533**	.553**	-.008	-.582**	-.713**	–								
9. FTT-POS	-.328**	-.373**	-.287**	-.296**	.042	.345**	.353**	-.315**	–							
10. FTT-NEG	.196**	.196**	.467**	.404**	-.069	-.038	-.271**	.236**	.068	–						
11. BMQ-N	-.366**	-.285**	-.396**	-.427**	.272**	.269**	.406**	-.254**	.228**	-.146	–					
12. BMQ-C	-.104	-.004	-.187*	-.223*	.433**	-.065	.078	.054	-.024	.025	.484**	–				

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
13. Adhere	-.530**	-.546**	-.629**	-.543**	.023	.504**	.464**	-.522**	.417**	-.292**	.233*	-.068	—			
14. QoL	-.439**	-.553**	-.416**	-.536**	-.061	.368**	.407**	-.592**	.418**	-.258**	.281**	-.212*	.709**	—		
15. FO	.481**	.597**	.396**	.552**	.099	-.440**	-.455**	.568**	-.230**	.149	-.220*	.026	-.349**	-.553**	—	
16. BF	-.306**	-.409**	-.334**	-.515**	.095	.097	.257**	-.143	.260**	-.150	.460**	.278**	.309**	.550**	-.285**	—
Mean	6.09	6.37	7.04	6.76	2.98	35.98	20.99	—	12.59	8.28	15.98	13.66	21.53	109.61	169.06	71.00
SD	5.35	5.40	5.38	4.75	2.33	6.14	4.92	—	3.80	2.44	4.68	2.82	3.98	28.94	39.02	11.55

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Note. DEP= Depression; ANX= Anxiety; RAG=Roles and Goals; RLOC= Recovery Locus of Control; OPT=Optimism; FTT-POS=Future thinking task-positive expectancies; FTT-NEG=Future thinking task-negative expectancies MED= Medication beliefs; FTT= Future thinking task; BMQ-N=Beliefs about medicines-Necessity; BMQ-C=Beliefs about medicines-Concerns; Adhere=Medication adherence; QoL= Quality of life; FO=Functional outcome; BF=Benefit finding

<u>8.3.4 Hierarchical Multiple Regression Analysis</u>

A series of hierarchical multiple regression analyses was conducted to determine what factors were predictive of each outcome variable: (1) adherence, (2) quality of life, (3) functional outcome, (4) distress, and (5) benefit finding. As described in Section 8.2.5, the order in which variables were entered into the equation was determined theoretically. Variables were selected for inclusion if they correlated significantly with the outcome variable as described in Section 8.3.3. Finally, if the regression analyses suggested that mediation had occurred between personality and outcome, formal mediation analyses were conducted using Baron and Kenny's (1986) conditions for mediation, as described in Section 8.2.5.

<u>8.3.4.1 Adherence</u>

As demonstrated in Table 8.6, a multivariate hierarchical regression analysis with adherence at 3 months post-MI as the outcome variable was conducted. The variables were entered into the regression model in a series of steps as follows: the demographic (age, sex, deprivation) and clinical variables (LVF, previous MI) were entered in the first steps. Taken together, these variables accounted for a significant 8.6% of the variance in adherence ($R^2 = .086$). Next, Type D personality was entered at Step 3, and significantly increased the variance explained by 20.9% ($R^2 = .209$). Optimism was then entered but it did not significantly increase the amount of variance explained. Depression and anxiety were then entered at Step 5, and significantly increased the variance explained by 6% to 37.7% ($R^2 = .377$). None of the remaining predictors (illness perceptions, medication beliefs, locus of control) added significantly to the amount of variance explained. The final model explained 41.5% of

the variance in adherence (R^2 = .451), with high anxiety (β = -0.534, p<.05) being the only significant predictor of adherence in the final model.

The regression model suggests that illness perceptions may mediate the relationship between Type D and adherence. However, as illness perceptions do not predict adherence when Type D is controlled for (as shown in Table 8.7), condition 3 for mediation is not met (Baron and Kenny, 1986). Therefore, there is no evidence for mediation in this case.

Table 8.6 Hierarchical regression analysis of adherence

		β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	β Step 8	Change R² for step	Total R²
1	**Demographics**									**0.052**	**0.052**
	Age	-0.158	-0.153	-0.030	-0.021	-0.099	-0.005	-0.007	-0.017		
	Sex	0.034	0.013	0.029	0.023	0.059	0.063	0.062	0.050		
	DEPCAT	-0.127	-0.130	-0.088	-0.099	-0.086	-0.101	-0.101	-0.106		
2	**MI Severity**									**0.034**	**0.086***
	LVF		-0.163	-0.111	-0.104	-0.132	-0.112	-0.112	-0.092		
	Previous MI		-0.087	-0.026	-0.023	0.026	0.022	0.024	0.013		
3	**Type D**			-0.485**	-0.351**	-0.237*	-0.047	-0.057	-0.068	**0.209***	**0.295***
4	**Optimism**				0.200	-0.008	0.058	0.047	-0.068	**0.021**	**0.316***
5	**Distress**									**0.060***	**0.377***
	Depression					-0.155	0.245	0.243	0.296		
	Anxiety					-0.253	-0.541*	-.536*	-0.534*		
6	**Illness Perceptions**									**0.020**	**0.397***
	Identity						-0.036	-0.037	-0.033		
	Treatment control						0.138	0.139	0.104		
	Consequences						-0.191	-0.181	-0.153		
7	**Medication Necessity**							0.026	0.048	**0.001**	**0.397***
8	**Locus of Control**								0.228	**0.017**	**0.415***

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

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Table 8.7 presents the hierarchical regression analysis of quality of life (overall score). Demographic and clinical factors were again entered in the first steps, taken together these variables accounted for a significant 17% (R^2 = .170) of the variance in quality of life. Type D was then entered at Step 3, significantly increasing the variance explained by 24.7% (R^2 = .247). The addition of optimism at Step 4 did not increase the amount of variance explained. Depression and anxiety were then entered at Step 5, their inclusion significantly increased the amount of variance explained by 5.9% (R^2 = .059), with anxiety (β = -0.531, p< .01) being responsible for the increase in variance explained. Illness perceptions were then entered at Step 6, but they did not significantly increase the amount of variance explained. Finally, future thinking (positive and negative) was entered at Step 7, significantly increasing the amount of variance explained by 4.8%. The final model accounted for 54.3% (R^2 = .543) of the variance in quality of life. Higher impairment of LVF (β = -0.146, p<.05), low positive future thinking (β = 0.248, p<.01), and high anxiety (β = -0.462, p<.05) remained significant predictors of quality of life in the final model.

The regression model suggests that illness perceptions may mediate the effect of Type D on quality of life. However, again, illness perceptions do not predict quality of life when Type D is controlled for (as shown in Table 8.8), condition 3 for mediation is not met (Baron and Kenny, 1986).

8.3.4.2.1 Emotional Quality of Life

The hierarchical regression analysis of emotional quality of life is shown in Table 8.8. Again, demographic and clinical factors were entered in the first steps. Taken

together, these variables accounted for a significant 14.3% ($R^2 = 0.143$) of the variance in emotional quality of life. Type D then entered the equation at Step 3, and significantly explained an additional 27.4% of the variance ($R^2 = 0.274$). The addition of optimism at Step 4 did not significantly increase the variance explained. Depression and anxiety were then entered at Step 5, their inclusion significantly increased the variance explained by 4.4% ($R^2 = 0.044$). Illness perceptions (timeline and consequences) were then entered at Step 6, however, their inclusion did not significantly increase the amount of variance explained. In Step 7, future thinking (positive and negative) was added, and significantly explained an additional 5% of the variance. The final model accounted for 52.1% of the variance (Total $R^2 = 0.521$) in emotional quality of life. Higher impairment of LVF ($\beta = -0.161$, $p<.05$), low positive future thinking ($\beta = 0.248$, $p<.01$), and having a Type D personality ($\beta = -0.439$, $p<.01$), all remained significant predictors of emotional quality of life in the final model. As Type D remained significant at this stage it is not necessary to test for mediation.

8.3.4.2.2 Social Quality of Life

Table 8.9 presents the analysis for social quality of life. Demographic and clinical factors were again entered first. Taken together, their inclusion explains a significant 16.5% of the variance in social quality of life (Total $R^2 = 0.165$). Type D was then entered at Step 3, significantly explaining an additional 21.5% of the variance ($R^2 = 0.215$). Optimism was entered at Step 4, but it did not add significantly to the model. In Step 5, depression and anxiety were entered. Their inclusion accounted for a significantly additional 3.9% of the variance ($R^2 = 0.039$). Illness perceptions (timeline and consequences) then entered the equation at Step 6, and significantly

explained an additional 4.4% of the variance ($R^2 = 0.044$). Finally, future thinking (positive and negative) was entered at Step 7, and explained an additional 4.7% of the variance ($R^2 = 0.047$). The final model accounted for 51% of the variance in social quality of life. In the final model, low positive future thinking ($\beta = 0.228$, p<.01), high anxiety ($\beta = -0.531$, p<.05), and the belief that your illness has more serious consequences ($\beta = -0.258$, p<.05), remained significant predictors of social quality of life.

The regression model suggests that illness perceptions (consequences) may mediate the relationship between Type D and social quality of life. Conditions 1-3 for mediation were met as Type D significantly affects the mediator (i.e., illness perceptions); (2) the independent variable affects the dependent variable (i.e., social quality of life); (3) illness perceptions affects social quality of life after controlling for Type D (as shown in Table 8.10). Furthermore, condition 4 was met as the addition of illness perceptions (consequences) reduced the beta coefficient of Type D from $\beta = -0.357$ (p<0.01) to non-significance, $\beta = 0.036$. The Sobel test confirmed that the relationship between Type D and social quality of life had been significantly reduced, z=-2.45, p<.05.

8.3.4.2.2 Physical Quality of Life

Table 8.10 presents the regression analysis of physical quality of life. Demographic and clinical factors were entered first, and significantly explained 18.8% of the variance ($R^2 = 0.188$). Next, Type D was entered at Step 3, it increased the variance explained by 22.6% ($R^2 = 0.226$). Optimism was entered next but it did not add significantly to the model. Depression and anxiety were then entered at Step 5, their

inclusion increased the variance explained by 7.8% ($R^2 = 0.078$). Illness perceptions (timeline and consequences) were then entered, they explained an additional 3.2% of the variance ($R^2 = 0.032$). Future thinking (positive and negative) was then entered in the final step and increased the variance explained by 4.2% ($R^2 = 0.042$). Overall, the final model accounted for 57.3% of the variance in physical quality of life ($R^2 = 0.573$). Higher impairment of LVF($\beta = -0.132$, $p<.05$), having experienced a previous MI ($\beta = -0.144$, $p<.05$), high anxiety ($\beta = -0.581$, $p<.05$), low positive future thinking ($\beta = 0.236$, $p<.01$) , and the belief that your illness would last for longer ($\beta = -0.182$, $p<.05$), remained significant predictors of physical quality of life in the final model.

The model suggests illness perceptions (consequences) may mediate the relationship between Type D and physical quality of life. Conditions 1-3 for mediation were met as Type D significantly affects the mediator (e.g., illness perceptions); (2) the independent variable affects the dependent variable (e.g., quality of life); (3) the mediator affects the dependent variable when the independent variable is controlled. In addition condition 4 was met as the addition of illness perceptions (consequences) reduced the beta coefficient of Type D from $\beta=-0.273$ ($p<0.01$) to non-significance, $\beta=0.031$. The Sobel test confirmed that the relationship between Type D and physical quality of life had been significantly reduced, $z=-4.19$, $p<.01$.

Table 8.7 Hierarchical regression analysis of quality of life

	β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1 Demographics								**0.068***	**0.068***
Age	-0.159	-0.159	-0.025	-0.025	0.006	0.011	0.034		
Sex	-0.003	-0.040	-0.022	-0.022	0.002	-0.013	0.005		
DEPCAT	-0.171	-0.157	-0.111	-0.112	-0.130	-0.142*	-0.100		
2 MI Severity								**0.102****	**0.170****
LVF		-0.214*	-0.158*	-0.158*	-0.182**	-0.160*	-0.146*		
Previous MI		-0.168**	-0.168*	-0.168*	-0.111	-0.098	-0.130		
3 Type D			-0.528**	-0.527**	-0.388**	-0.141	-0.230	**0.247****	**0.417****
4 Optimism				0.001	-0.034	0.050	-0.071	**0.000**	**0.417****
5 Distress								**0.059****	**0.475****
Depression					-0.287	-0.467*	0.294		
Anxiety					-0.531**	-0.692**	-0.462*		
6 Illness Perceptions								**0.020**	**0.495****
Timeline						-0.121	-0.134		
Consequences						-0.197	-0.113		
7 Future Thinking								**0.048****	**0.543****
Positive							0.248**		
Negative							-0.099		

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

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Table 8.8 Hierarchical regression analysis of emotional quality of life

	β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1 Demographics								**0.056**	**0.056**
Age	-0.153	-0.151	-0.010	-0.014	0.012	0.015	0.041		
Sex	0.006	-0.028	-0.009	-0.007	0.015	0.006	0.026		
DEPCAT	-0.147	-0.140	-0.092	-0.088	-0.101	-0.108	-0.066		
2 MI Severity								**0.086****	**0.143****
LVF		-0.220*	-0.161*	-0.164*	-0.185**	-0.173*	-0.161*		
Previous MI		-0.193	-0.122	-0.124	-0.074	-0.067	-0.102		
3 Type D			-0.556**	-0.613**	-0.492**	-0.349*	-0.439**	**0.274****	**0.417****
4 Optimism				-0.085	-0.132	-0.083	-0.214	**0.004**	**0.420****
5 Distress								**0.044****	**0.464****
Depression					-0.215	-0.321	-0.151		
Anxiety					-0.444*	-0.540*	-0.312		
6 Illness Perceptions								**0.006**	**0.470****
Timeline						-0.067	-0.077		
Consequences						-0.115	-0.029		
7 Future Thinking								**0.050****	**0.521****
Positive							0.248**		
Negative							-0.127		

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

Table 8.9 Hierarchical regression analysis of social quality of life

	β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1 Demographics								**0.073***	**0.073***
Age	-0.147	-0.147	-0.022	-0.021	0.004	0.008	0.037		
Sex	-0.014	-0.049	-0.032	-0.033	-0.013	-0.038	-0.019		
DEPCAT	-0.193	-0.180*	-0.138	-0.140	-0.154*	-0.170*	-0.131		
2 MI Severity								**0.092****	**0.165****
LVF		-0.205*	-0.152*	-0.151*	-0.170*	-0.141*	-0.132		
Previous MI		-0.221	-0.159*	-0.159*	-0.112	-0.100	-0.135		
3 Type D			-0.492**	-0.470**	-0.357**	0.036	-0.048	**0.215****	**0.380****
4 Optimism				0.032	0.005	0.139	0.006	**0.001**	**0.380****
5 Distress								**0.039***	**0.420****
Depression					-0.237	-0.570*	-0.415		
Anxiety					-0.434**	-0.740**	-0.531*		
6 Illness Perceptions								**0.044****	**0.463****
Timeline						-0.140	-0.146		
Consequences						-0.343**	-0.258*		
7 Future Thinking								**0.047****	**0.510****
Positive							0.228**		
Negative							-0.151		

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

Table 8.10 Hierarchical regression analysis of physical quality of life

		β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1	**Demographics**								**0.075***	**0.075***
	Age	-0.168	-0.171*	-0.043	-0.038	-0.002	0.007	0.027		
	Sex	-0.008	-0.046	-0.029	-0.032	-0.006	-0.024	-0.008		
	DEPCAT	-0.177*	-0.158	-0.114	-0.120	-0.142*	-0.159*	-0.120		
2	**MI Severity**								**0.113****	**0.188****
	LVF		-0.205*	-0.151*	-0.147*	-0.174*	-0.145*	-0.132*		
	Previous MI		-0.265**	-0.201*	-0.199**	-0.133	-0.115	-0.144*		
3	**Type D**			-0.505**	-0.433**	-0.273**	0.031	-0.052	**0.226****	**0.414****
4	**Optimism**				0.108	0.077	0.181	0.070	**0.006**	**0.420****
5	**Distress**								**0.078****	**0.498****
	Depression					-0.351*	-0.544**	-0.390		
	Anxiety					-0.620**	-0.799**	-0.581*		
6	**Illness Perceptions**								**0.032***	**0.530****
	Timeline						-0.169	-0.182*		
	Consequences						-0.231*	-0.154		
7	**Future Thinking**								**0.042****	**0.573****
	Positive							0.236**		
	Negative							-0.085		

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

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8.3.2.3 Functional Outcome

Table 8.11 presents the regression model for functional outcome. The demographic and clinical factors were entered in the first steps, and explained a significant 9.4% of the variance ($R^2 = 0.094$). Type D was then entered at Step 3 and significantly increased the amount of variance explained by 25.3% ($R^2 = 0.253$). Optimism was then entered but it did not add significantly to the amount of variance explained. Depression and anxiety were then entered at Step 5; their inclusion significantly increased the variance explained by 8.7% ($R^2 = 0.087$). Illness perceptions and medication beliefs, and future thinking were then entered, but their inclusion did not add significantly to the model. The final model accounted for 48.2% of the variance in functional outcome ($R^2 = 0.482$). Higher levels of depression ($\beta = 0.645$, p<.05) and anxiety ($\beta = 0.872$, p<.01) at time 1 remained significant predictors of functional outcome in the final model.

The regression model suggests that illness perceptions may mediate the relationship between Type D and functional outcome. However, as illness perceptions do not predict functional outcome when Type D is controlled for (as shown in Table 8.12), condition 3 for mediation is not met (Baron and Kenny, 1986).

Table 8.11 Hierarchical regression analysis of functional outcome

		β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	β Step 8	Change R² for step	Total R²
1	**Demographics**									**0.037**	**0.037**
	Age	0.146	0.151	0.015	0.010	-0.027	-0.030	-0.029	-0.009		
	Sex	-0.010	0.015	-0.003	0.001	-0.030	-0.029	-0.027	-0.019		
	DEPCAT	0.095	0.076	0.029	0.036	0.056	0.076	0.077	0.094		
2	**MI Severity**									**0.057***	**0.094***
	LVF		0.119	0.061	0.057	0.087	0.072	0.072	0.068		
	Previous MI		0.206*	0.139	0.137	0.066	0.070	0.068	0.049		
3	**Type D**			0.534**	0.452**	0.282**	0.193	0.200	0.170	**0.253****	**0.348****
4	**Optimism**				-0.122	-0.066	-0.054	-0.044	-0.114	**0.008**	**0.355****
5	**Distress**									**0.087****	**0.443****
	Depression					0.324	0.578*	0.576*	0.645*		
	Anxiety					0.638**	0.870**	0.864**	0.872**		
6	**Illness Perceptions**									**0.025**	**0.468****
	Identity						-0.143	-0.140	-0.144		
	Treatment control						-0.178	-0.178	-0.202		
	Consequences						0.163	0.153	0.190		
	Timeline						-0.037	-0.033	-0.027		
7	**Medication**									**0.000**	**0.468****
	Necessity							-0.026	-0.029		
8	**Future Thinking**									**0.014**	**0.482****
	Positive								0.076		
	Negative								-0.128		

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

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8.3.2.4.1 Hierarchical Regression of Depression

Table 8.12 presents the regression model for depression at time 2. Distress (depression and anxiety) at time 1 entered the equation at the first step, and explained a significant 73.1% of the variance ($R^2 = 0.731$). Demographics, MI severity, Type D, optimism and illness perceptions were then entered into the model, but their inclusion did not increase the amount of variance explained significantly. Finally, future thinking (positive and negative) was entered at Step 7, and significantly explained an additional 2.1% of the variance ($R^2 = 0.021$). The final model accounted for 77.9% of the variance in depression at time 2 ($R^2 = 0.779$). Higher levels of depression at time 1 ($\beta = 0.839$, $p<.01$), a lower number of positive thoughts ($\beta = -0.102$, $p<.05$) , and a higher number of negative thoughts ($\beta = 0.157$, $p<.01$) remained significant predictors in the final model.

8.3.2.4.2 Hierarchical Regression of Anxiety

The regression model for anxiety at time 2 is presented in Table 8.13. Distress (depression and anxiety) at time 1 was again entered in the first step, and significantly explained 64.9% of the variance ($R^2 = 0.649$). Demographics, MI severity, Type D, and optimism were then entered, but their inclusion did not add significantly to the amount of variance explained. Illness perceptions (timeline, consequences, identity, treatment control) were then entered at Step 6, and significantly explained an additional 5.4% of the variance ($R^2 = 0.054$). Finally, future thinking (positive and negative) was entered at Step 7, but it did not add significantly to the model. The final model accounted for 73.8% of the variance in anxiety at time 2 ($R^2 = 0.738$). Treatment control ($\beta = -0.256$, $p<.05$), previous MI ($\beta = 0.122$, $p<.05$), and anxiety at

time 1 (β = 0.735, p<.01), remained significant predictors in the final model. Anxiety

at time 2 was therefore predicted by higher anxiety at time 1, a lower perception of

treatment control, and whether patients had experienced a previous MI.

Table 8.12 Hierarchical regression analysis of depression at time 2

		β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1	**Distress**								**0.731****	**0.731****
	Depression T1	0.976**	0.986**	0.995**	0.993**	1.016**	0.748**	0.839**		
	Anxiety T1	0.139	0.165	0.184	0.191	-0.197	0.065	0.170		
2	**Demographics**								**0.007**	**0.739****
	Age		0.087	0.092	0.091	0.092	0.079	0.055		
	Sex		-0.022	-0.017	-0.091	-0.19	-0.034	-0.045		
	DEPCAT		-0.018	-0.024	-0.025	-0.027	-0.010	-0.033		
3	**MI Severity**								**0.002**	**0.741****
	LVF			0.005	0.004	0.005	-0.018	-0.013		
	Previous MI			0.044	0.044	0.044	0.036	0.060		
4	**Type D**				0.014	0.025	-0.078	-0.039	**0.000**	**0.741****
5	**Optimism**					0.030	-0.015	0.074	**0.000**	**0.741****
6	**Illness Perceptions**								**0.017**	**0.758****
	Timeline						0.065	0.059		
	Consequences						0.049	-0.001		
	Identity						0.075	0.082		
	Treatment Control						-0.141	-0.112		
7	**Future Thinking**								**0.021****	**0.779****
	Positive							-0.102*		
	Negative							0.157**		

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

Table 8.13 Hierarchical regression analysis of anxiety at time 2

		β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1	**Distress**								**0.649****	**0.649****
	Depression T1	0.206	0.224*	0.250*	0.249*	0.168	0.308	0.269		
	Anxiety T1	0.617**	0.580**	0.528**	0.524**	0.547**	0.776**	0.735**		
2	**Demographics**								**0.012**	**0.661****
	Age		0.114*	0.128*	0.127*	0.122*	0.099	0.087		
	Sex		0.004	0.015	0.016	0.022	-0.008	-0.013		
	DEPCAT		-0.046	-0.063	-0.063	-0.054	-0.023	-0.033		
3	**MI Severity**								**0.013**	**0.674****
	LVF			0.007	0.006	0.001	-0.038	-0.034		
	Previous MI			0.120*	0.120*	0.122*	0.110*	0.122*		
4	**Type D**				0.008	-0.031	-0.179	-0.162	**0.000**	**0.674****
5	**Optimism**					-0.109	-0.175	-0.130	**0.004**	**0.678****
6	**Illness Perceptions**								**0.054****	**0.732****
	Timeline						0.092	0.087		
	Consequences						0.064	0.042		
	Identity						0.131	0.132		
	Treatment Control						-0.271**	-0.256*		
7	**Future Thinking**								**0.006**	**0.738****
	Positive							-0.038		
	Negative							0.087		

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

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<u>8.3.2.5 Benefit Finding</u>

Table 8.14 presents the regression model for benefit finding. Demographic and clinical factors were entered in the first steps, their inclusion explained a non-significant 5.5% of the variance. Next, Type D entered at Step 3, but it did not significantly increase the amount of variance explained. Optimism was entered at Step 4, significantly explaining an additional 4.9% of the variance ($R^2 = 0.049$). Depression and anxiety were then entered at Step 5, their inclusion significantly explained an additional 13.3% of variance ($R^2 = 0.133$). Next, illness perceptions (timeline and comprehensibility) were entered, and significantly explained an extra 16.7% of the variance ($R^2 = 0.167$). Finally, future thinking (positive and negative) was entered at Step 7, but their inclusion failed to add significantly to the variance explained. Overall, the model accounted for 41.6% of the variance in benefit finding ($R^2 = 0.416$). Optimism ($\beta = 0.279$, p<.05) and comprehensibility ($\beta = -0.562$, p<.05) remained significant predictors in the final model. Thus, in the final model, higher levels of optimism and lower levels of comprehensibility predicted benefit finding.

Table 8.15 provides a summary a summary table relating to the significant predictors of each outcome variable

Table 8.14 Hierarchical regression analysis of benefit finding

		β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7	Change R² for step	Total R²
1	**Demographics**								**0.014**	**0.014**
	Age	-0.042	-0.056	-0.029	-0.015	0.031	-0.001	0.003		
	Sex	0.019	0.008	0.011	0.003	0.040	0.058	0.060		
	DEPCAT	-0.100	-0.066	-0.057	-0.073	-0.098	-0.030	-0.022		
2	**MI Severity**								**0.041**	**0.055**
	LVF		0.027	0.039	0.049	0.013	-0.047	-0.040		
	Previous MI		-0.203*	-0.190*	-0.185*	-0.098	-0.036	-0.044		
3	**Type D**			-0.105	0.098	0.308*	-0.006	-0.001	**0.010**	**0.065**
4	**Optimism**				0.303*	0.236	0.299*	0.279*	**0.049***	**0.113***
5	**Distress**								**0.133****	**0.246****
	Depression					-0.401*	-0.099	-0.112		
	Anxiety					-0.786**	-0.087	-0.063		
6	**Illness Perceptions**								**0.167****	**0.413****
	Timeline						0.001	-0.008		
	Comprehensibility						-0.575**	-0.562*		
7	**Future Thinking**								**0.003**	**0.416****
	Positive							0.063		
	Negative							-0.011		

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

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Table 8.15 Summary table for the significant predictors of each outcome variable

Adherence	Overall QoL	Emotional QoL	Social QoL	Physical QoL	Functional Outcome	Depression T2	Anxiety T2	Benefit Finding
Anxiety	LVF	LVF	Anxiety	LVF	Depression	Depression	Anxiety	Optimism
	Anxiety	Type D	Consequences	Previous MI	Anxiety	Positive Future Thinking	Previous MI	Comprehensibility
	Positive Future Thinking	Positive Future Thinking	Positive Future Thinking	Anxiety		Negative Future Thinking	Treatment Control	
				Timeline				
				Positive Future Thinking				

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8.4 Discussion

The broad aim of the current study was to identify predictors of psychosocial and psychological outcome post-MI. Specifically, the study had four key aims; (i) To investigate the prevalence of Type D personality in the current sample, and the relationship between Type D and each of the variables under investigation; (ii) to investigate if personality predicts outcome after controlling for clinical and demographic variables; (iii) to determine if personality predicts outcome after controlling for mood, and (iv) to identify the mechanisms by which personality is associated with adverse psychological outcome.

8.4.1 The Role of Type D Personality

8.4.1.1 Prevalence of Type D Personality

The prevalence of Type D personality in the current sample was found to be 33.9%. To our knowledge, this is the first time that the prevalence of Type D personality has been investigated in a sample of cardiac patients in the UK. Previous studies, in other European cardiac populations have found prevalence rates of between 25-28% (Denollet, 2005; Grande et al, 2004; Gremigni et al, 2005). Although the prevalence found in the current sample is higher, it was not found to be significantly higher than that found in other countries. The rate found in the present sample is also similar to that found in the general population in the studies reported in Chapter 5 (section 5.3.1) and 6 (section 6.6.1) which found rates of 39%.

8.4.1.2 Stability of Type D Personality

The stability of Type D personality was also assessed in the current study. It was found that 86.4% of the sample was consistently classified as Type D or non-Type D

at time 1, and 3 months later at time 2. The first study presented in Chapter 6 found the stability of the Type D construct to be lower in a healthy population, at 76.7%. However, Pelle et al (in press) report similar findings to the present study, with 81% of their cardiac sample being classified in the same way across two time points, also three months apart. These findings, therefore, suggest that Type D is a relatively stable construct over time. As Type D is intended to represent a personality trait then it would be necessary for the measure to show good stability over time.

However, it should be noted that despite the high percentage of those individuals being classified the same at both time points, approximately 1 in 5 were not classified consistently as Type D or non-Type D over a relatively short period of 3 months. Indeed, as Type D personality delineates a stable personality trait it is important to question whether classifying 13.6% of the sample differently on 2 occasions, separated by only 3 months, is satisfactory. Therefore, future research is required to investigate the stability of Type D over longer periods of time.

8.4.1.3 The Relationship between Type D and the Outcome and Predictor Variables
It was also important to determine the relationship between Type D and each of the variables under investigation. With regards to the outcome measures, Type D individuals reported lower quality of life and medication adherence. They also reported higher levels of functional impairment and a greater number of symptoms of depression and anxiety. Previous research has also found Type D to be related to outcome in cardiac patients. For example, Al-Ruzzeh et al (2005) found an association between Type D and poor quality of life. In addition, Denollet et al (1995) and Schiffer et al (2005) also found Type D to be related to symptoms of depression

and anxiety. However, the current study is the first to suggest a relationship between Type D and medication adherence. If Type D individuals are less likely to take their medication as directed then this could help to explain why Type D patients have poor clinical outcome relative to non-Type D patients.

The relationship between Type D and each of the predictor variables was also examined. It was found that Type D individuals were less optimistic than their non-Type D counterparts. Denollet (1998) had also identified a relationship between Type D and optimism. The current study also identified a relationship between Type D and locus of control for the first time, with Type D individuals believing that they had less control over their recovery than non-Type D's. The current study is also the first to establish a relationship between Type D and all illness perceptions. Specifically, Type D's believed their illness to be less controllable by themselves or by treatment. In addition, they understood their illness less, believed it would last for longer, and experienced more emotions and symptoms as a result of their illness. Importantly, Type D individuals can therefore be seen to be different to non-Type D individuals on all illness perceptions. These findings suggest that one way that Type D leads to poor cardiac outcome is through illness perceptions.

Furthermore, the current study also identified a relationship between future thinking and Type D for the first time. Type D's produced fewer positive thoughts and more negative future thoughts. All of these relationships suggest possible mechanisms by which Type D may affect health. Sections 8.4.2 – 8.4.6 outline which of these possible mechanisms were found to be important in relation to the outcome measures.

As in the studies described in Chapter 5 (section 5.3.3) and 6 (section 6.6.4), the current study also found a relationship between Type D and health-related behaviours. Type D's were less likely to eat sensibly or get enough sleep compared to non-Type D participants. In addition, Type D patients were found to be significantly more likely to be smokers compared to their non-Type D counterparts.

8.4.1.4 Does Type D Personality Predict Outcome After Controlling for Demographic and Clinical Factors?

A further aim of the study was to determine if Type D predicts outcome after controlling for clinical and demographic factors. As demonstrated by the hierarchical multiple regression analyses, Type D was a significant predictor of adherence, quality of life, and functional outcome, after controlling for demographic and clinical factors. Indeed, Type D consistently predicted an additional 20-25% of the variance of each variable. Previous research (e.g. Denollet et al, 1996) has also found that Type D is predictive of both mortality and morbidity after controlling for biomedical factors. In the current study Type D is a stable predictor of psychological morbidity post-MI, increasing the variance explained by traditional demographic and clinical factors by 20-25%.

8.4.1.5 Does Type D Personality Predict Outcome After Controlling for Mood?

Given that some theorists (e.g. Lesperance & Frasure-Smith, 1996) have criticised Type D as just being another measure of negative affect, it is important to ascertain whether Type D will remain a significant predictor of outcome in the current study once depression and anxiety are added to the equation. For adherence, quality of life, and functional outcome Type D remained a significant predictor, even after

depression and anxiety were controlled for. In addition, Denollet et al (2006) found that it was the interaction of social inhibition and negative emotions, rather than negative emotions per se, which predicted poor clinical outcome. Taken together, the findings from the current study and the study by Denollet et al (2006) demonstrate that Type D is not simply a measure of negative affectivity.

The following sections outline which factors were the best predictors of each of the outcome variables (adherence, quality of life, functional outcome, depression, anxiety, benefit finding).

8.4.2 Predictors of Medication Adherence Post-MI

Results from the regression analyses (section 8.3.4.1) demonstrate that Type D personality and psychological distress were significant predictors of adherence post-MI. Type D patients, and those experiencing a greater number of symptoms of anxiety reporting lower levels of medication adherence. This is the first study to identify a relationship between Type D and adherence, and suggests one possible way in which Type D may be associated with poor outcome. However, anxiety was found to be the best predictor of adherence. Previous research has also identified that psychological distress is associated with adherence (e.g. Carney et al, 1995). However, surprisingly illness perceptions and medication beliefs were not found to be predictive of adherence. Previous research, for example, Byrne, Walsh & Murphy (2005) found an association between illness perceptions and preventive behaviour, and a relationship between medication beliefs and adherence to medication.

8.4.3 Predictors of Quality of Life Post-MI

For overall quality of life, demographics, MI severity, Type D, distress, and future thinking were found to be significant predictors. Similar findings regarding the predictive utility of Type D (Al-Ruzzeh et al, 2005), and psychological distress in relation to quality of life have been reported previously. For example, Lane et al (2001) found that poorer quality of life at 12 months was predicted by greater baseline level of depression, greater severity of infarction, living alone, and state anxiety. However, the current study is the first to identify a relationship between future thinking and outcome in MI patients. Previous research has found that future thinking is an important risk factor for depression and suicide risk. However, relatively little research has examined the predictive utility of future thinking in patients with physical health problems. Recently, Moore et al (2006) found that depressed multiple sclerosis patients had a lack of positive thoughts about the future. Similarly, results in the current study found that patients with lower quality of life also had a lack of positive future thoughts. The best predictors of quality of life were found to be LVF, anxiety and positive future thinking. Thus, patients with poorer LVF, greater symptoms of anxiety, and those who had a lack of positive future thoughts had poorer quality of life.

A similar pattern of results was found for emotional quality of life, with MI severity, Type D, distress and future thinking being significant predictors. LVF, Type D, and positive future thinking remained significant predictors in the final model. For social quality of life, demographics, MI severity, Type D, distress, illness perceptions and future thinking were all significant predictors. However, in the final model only anxiety, consequences, and positive future thinking remained significant predictors.

Social quality of life is therefore predicted by high levels of anxiety, believing that your illness will have more serious consequences, and a lack of positive future thoughts. The role of illness perceptions in predicting quality of life of MI patients was also identified by Petrie et al (1996). They also found that patients who believed their MI would have more serious long-lasting consequences had higher levels of illness-related disability and were slower to return to work. Results from the current therefore add further evidence relating to the importance of illness perceptions in the recovery of MI patients.

For physical quality of life, demographics, MI severity, Type D, distress, illness perceptions, and future thinking all significantly increased the amount of variance explained. However, in the final model, MI severity, anxiety, timeline and positive future thinking remained significant. Physical quality of life was therefore best predicted by increased severity of MI, greater symptoms of anxiety, the belief that your illness would last for a longer period of time, and a lack of positive future thoughts. Again, these results highlight the importance of illness perceptions in predicting outcome post-MI. Importantly, Petrie et al (2002) have demonstrated that it is possible to change patients' illness perceptions, and in turn improve their outcome.

Overall, when considering the subscales and the total score, these findings suggest that there are several key predictors of quality of life post-MI. First, demographics and MI severity are important determinants. However, the psychological variables do predict quality of life even after controlling for these factors. Second, Type D is an important predictor in the early steps of the model but its effect seems to be mediated by illness perceptions (see Section 8.4.7). Third, psychological distress is also an

important predictor. Specifically, symptoms of anxiety are associated with poorer quality of life. Fourth, the current study adds further evidence to support the role of illness perceptions in predicting the outcome of post-MI patients. Patients' beliefs regarding consequences and timeline of their MI were particularly important. Finally, the current study has identified for the first time the importance of future thinking in predicting quality of life post-MI, specifically, a lack of positive future thoughts is related to poorer quality of life.

8.4.4 Predictors of Functional Outcome Post-MI

The predictors of functional outcome were also identified. MI severity, Type D, and distress were all significant predictors. However, only psychological distress remained a significant predictor in the final model. In line with previous research (e.g. Mayou et al, 2000) symptoms of both depression and anxiety predicted functional outcome. Similarly, de Jonge et al (2006) found that patients with post-MI depression had more disability at 12 months post-MI.

8.4.5 Predictors of Distress Post-MI

In the current sample, 20.3% of patients scored as possible cases of anxiety, and 16.1% scored as possible cases of depression. These findings demonstrate that symptoms of depression and anxiety are prevalent in post-MI patients. Previous studies have also reported symptoms of depression and anxiety to be common problems in MI patients. Indeed, previous studies report prevalence rates of depression ranging from 17-37% in terms of probably caseness (Frasure-Smith et al, 1995; Ladwig et al, 1994), and prevalence rates of anxiety between 24-31% (Frasure-Smith et al, 1995; 1999).

It is also of importance to determine predictors of psychological distress post-MI. As expected, the best predictor of depression at time 2 was depression at time 1. However, future thinking also emerged as a significant predictor. A lack of positive future thoughts and a higher number of positive negative thoughts were both found to predict depression at 3 months post-MI. As mentioned previously, the current study is the first to examine the predictive utility of future thinking in MI patients. Findings from the current study suggest that future thinking is therefore predictive of both quality of life and depression post-MI. Previous research on future thinking has found that depressed individuals have difficulties thinking about the future. Indeed, earlier research has found future thinking to be related to depression in a number of patient groups, including those with multiple sclerosis (Moore et al, 2006),and tinnitus (Andersson et al, 2007). The current findings therefore extend the available evidence on future thinking, by identifying for the first time that future thinking is predictive of post-MI depressive symptoms.

For anxiety at time 2, three factors emerged as significant predictors. They were anxiety at time 1, previous MI, and treatment control. Therefore, patients who experienced a greater number of symptoms of anxiety at time 1, those who had experienced an MI previously, and those who believed their illness was less controllable by treatment had a greater number of anxiety symptoms at time 2. These findings again suggest the importance of illness perceptions in predicting outcome post-MI.

8.4.6 Predictors of Benefit Finding Post-MI

Benefit finding was investigated as a possible positive outcome in MI patients. It was found that being more optimistic and understanding less about your illness were predictive of benefit finding post-MI. The relationship between optimism and benefit finding is unsurprising as these are largely similar constructs. However, of greater interest is the finding that understanding less about your illness is predictive of experiencing more benefits or gains from their illness. In this case it seems that understanding less about your illness may have a beneficial effect. This finding ties in with recent some recent research on benefit finding, which questions whether benefit finding is actually beneficial for the individual (e.g. Tomich & Helgeson, 2004). They believe that benefit finding may reflect a reluctance to concede the severity of one's diagnosis. The findings of the current study could therefore be understood as an individual's avoidance to understand more about their illness in order to protect themselves from painful or frightening information. It is possible that benefit finding reflects the denial and avoidance of illness related information. Benefit finding may therefore become maladaptive over time because it may interfere with effective coping strategies.

8.4.7 Type D Mechanisms of Effect

A further aim of the current study was to identify the mechanisms through which personality (Type D and optimism) may affect outcome. As optimism was only found to be predictive of benefit finding, and remained significant in the final model it is not possible to investigate any potential mediators of the optimism – outcome relationship.

Several possible cases of mediation relating to Type D personality were established, in each case it appears as though the relationship between Type D and outcome is being mediated by illness perceptions. It was found that patients' illness perceptions relating to consequences mediated the relationship between Type D and social quality of life, and Type D and physical quality of life.

Illness perceptions may, therefore, reflect one way in which Type D personality causes poor outcome in cardiac patients. In the current study, Type D affected social and physical quality of life because Type D individuals believed that their illness would have more serious long-lasting consequences than non-Type D individuals. This may be a particularly important finding in relation to developing interventions for Type D patients. Previous research by Petrie et al (2002) has identified that it is possible to modify patients' illness perceptions through intervention, and improve their outcome as a result. Thus, if the illness perceptions of Type D patients are modified it may be possible to improve their quality of life.

Moreover, linked to the association between Type D and health-related behaviour, Type D individuals were found to be less adherent to medication than non-Type D individuals. Clearly, if Type D individuals are not taking their medication as directed this will have a substantial impact on their outcome. Medication adherence therefore represents one very powerful mechanism to explain the link between Type D and adverse clinical outcome in cardiac disease.

Taken together with the findings from the other studies in this thesis, several possible mechanisms through which Type D may lead to adverse outcome have been identified. It has been found that Type D may affect health through health-related behaviour, adherence, social support, cardiovascular reactivity, and illness perceptions.

8.4.8 Limitations

It is important to acknowledge limitations of the current study. First, the study may be limited by the representativeness of the sample. The patient sample recruited for this study may have been affected by selection bias in the following way. Only patients who were well enough to be interviewed were recruited. These findings may, therefore, reflect patients who experienced a less serious MI than those who were too ill to participate. The sample may therefore not be representative of MI patients in general, but rather of those that had experienced a less serious MI, or those that had made a good recovery while hospitalised following MI. In addition, the considerable proportion of excluded patients during the different phases of the study should be considered. The number of patients who had incomplete assessments, or were lost to follow-up may have resulted in an under representation of patients with poor health status.

The study may also have been limited by the timing of when the Time 1 and Time 2 assessments took place. Patients' beliefs and illness perceptions were assessed within the first few days following admission, and may therefore have been influenced by the information given to them by nursing and medical staff. Patients are often given a lot of information whilst on the coronary care unit, including information about the causes of MI. In addition, all patients are also given a copy of the Heart Manual

(Lewin et al, 1992) in the first few days following admission which gives the patients advice on rehabilitation and secondary prevention of CHD. Therefore, although efforts were made to interview patients early in their treatment in order to elicit their own beliefs and illness perceptions, it is possible that they had already been influenced by information given to them during the initial stages of their hospital admission. More generally, the follow-up period of three months is relatively short, and can only allow conclusions to be drawn regarding the short-term recovery of MI patients. For example, it may be that the duration of follow-up was insufficient to detect effects which may be present at longer follow-up periods. However, timescale of the PhD made a short follow-up the only option.

The current study relied on self-report measures, and may therefore be subject to self presentation and recall biases which are common problems faced when using self-report measures. Specifically, the assessment of medication adherence is known to be affected by recall bias, indeed it has been estimated that self reports may underestimate the true extent of non-adherence by approximately 20% (Horne, 2000). In order to encourage patients to be as honest as possible without concern that their answers might influence their treatment, patients were assured that the information they gave would not be entered into their medical notes and that their doctor would not see their responses. Even so, this study was subject to the risk of interviewer bias whereby patients seek to offer answers they believe will please the interviewer, and recall bias involving over or underestimation of behaviours, such as medication adherence. In addition, the reliance on a self-report questionnaire rather than formal diagnostic criteria when assessing anxiety and depression may be a further limitation. As a result, the possibility of a self report bias, which may be present both in the self

reported depressive symptoms and the outcome measures, such as quality of life, cannot be ruled out. In addition, it would also have been beneficial to include a measure of social support in the current study in order to determine if it had a mediating role on the relationship between personality and outcome.

It is possible that the inconsistent pattern of results found in the current study is due to the relatively small sample size. Our sample only had the power to detect medium effect sizes and so may consequently have missed other smaller effects that may have been detected with more participants.

8.4.9 Conclusions and Future Research

Future research is required to determine if these are robust and replicable findings. In addition, it is important to determine if the relationships observed will remain significant in the longer term outcome of these patients. Furthermore, future research is required to identify further possible mediators of the personality – outcome relationship. It is important for both psychosocial and psychophysiological mechanisms to be investigated in cardiac patients in order to identify the proximal risk factors which explain the link between personality and outcome.

The current study has extended the existing research on personality and psychological outcome post-MI in several key ways. First, the Type D construct has been assessed in a British cardiac population for the first time. The Type D prevalence rate was found to be 33.9% in the current sample. In addition the stability of the measure was found to be good. Second, it was found that Type D predicted adherence, quality of life and functional impairment after controlling for demographic factors, clinical

factors and mood. Indeed, Type D exerted a consistent effect of outcome, explaining 20-25% of the variance of each outcome measure. Third, illness perceptions and adherence have been identified as a possible mechanism by which Type D may affect health.

The current findings have also extended the existing research on predictors of psychological outcome post-MI in a number of ways. First, the current study identified for the first time that future thinking may play an important role in predicting quality of life, functional impairment and depression post-MI. Second, the importance of depression and anxiety in predicting quality of life and functional impairment post-MI has again been highlighted. Third, the findings relating to illness perceptions have been extended, and confirm an important role for illness perceptions in predicting quality of life and benefit finding in MI patients.

Chapter 9: General Discussion

9.0 Overview

This final chapter offers a broad discussion of the key findings and whether the specific aims of the study have been met. It will discuss how the findings fit with previous research, outline the limitations of the thesis, and suggest areas where this research may be developed further. In addition, this chapter places the major findings within the theoretical context of Leventhal's CSM (Leventhal et al, 1980).

9.1 Introduction

Due to advancements in the treatment of CHD more people are now surviving cardiac events (Fox et al, 2007), meaning that there are large numbers of people in the UK who have experienced an MI, estimated at around 1.3 million people (British Heart Foundation, 2006). This represents a new problem as experiencing an MI can have a long lasting impact on an individual in terms of both physical and psychological adjustment and quality of life (Frasure-Smith & Lesperance, 2003). Therefore, in order to address the problem of psychological outcome post-MI this thesis sought to investigate which factors predict outcome, including quality of life, mood, functional impairment, adherence, and benefit finding in a prospective cohort of MI patients. Within this, a particular focus was placed on the role of personality. The concept of Type D personality was investigated, as it appears to be an emerging risk factor in CHD (Pedersen & Denollet, 2006).To this end, five studies were conducted which investigated the concept of Type D personality, and predictors of outcome post-MI within a self-regulatory framework. The thesis had four main aims:

(i) To investigate predictors of psychological outcome post-MI.

(ii) To determine the prevalence and stability of Type D Personality in the UK.

(iii) To determine if personality is predictive of psychological outcome after controlling for mood, and demographic and clinical factors.

(iv) To investigate potential mechanisms which may explain the link between personality and adverse outcome in cardiac patients, specifically, (a) health-related behaviours, and (b) cardiovascular reactivity.

9.2 Findings on Type D Personality

This thesis aimed to extend the available evidence relating to Type D personality. Specifically, to investigate potential ways in which Type D may be associated with adverse prognosis in cardiac patients. Denollet and Pedersen have repeatedly demonstrated that the Type D construct is a predictor of adverse prognosis in cardiac patients (Pedersen & Denollet, 2006). The study had several key aims in relation to Type D personality. They were, (i) to investigate the prevalence and stability of Type D personality in the UK; (ii) to determine if Type D is predictive of psychological outcome in MI patients after controlling for demographics, clinical factors and mood, and (iii) to investigate potential psychosocial and psychophysiological mechanisms which may explain the link between Type D and adverse outcome in cardiac patients.

9.2.1 Prevalence and Stability of Type D Personality

The first aim of this thesis was to establish the prevalence of Type D personality in the UK. This is the first study to have examined Type D prevalence in either a healthy or cardiac population from the UK. The standard Type D classification of ≥ 10 on both NA and SI subscales was used (Denollet, 2005). The prevalence of Type D

personality was found to be 38.5% in the healthy population (Chapter 5, section 5.3.1), and 33.9% in the cardiac population (Chapter 8, section 8.3.2). From this it is apparent that the prevalence of Type D is higher in the healthy population, compared to the MI patients. If Type D is an etiological risk factor for CHD (something that has not yet been established), then it would be expected that the cardiac population would contain a higher number of Type D cases, but this was not the case.

There are several possible explanations as to why the prevalence of Type D was higher in the healthy samples. First, the healthy sample is younger than the MI sample, and consists of university students who are known to suffer from high rates of psychological distress (Furr et al, 2001). This could have led to elevated scores on the SI and NA subscales, and consequently an increased Type D prevalence rate. Second, the healthy sample is predominantly female, while the MI sample is predominantly male. Although no gender differences in terms of prevalence were observed in any of the studies conducted within this thesis, a previous study by Pedersen and Middel (2001) found higher rates of Type D among female participants (41%) compared to males (26%).

The prevalence rates in the current studies are higher than the rates of between 21% and 32.5% that have been found elsewhere in Europe (Grande et al, 2004; Gremigni & Sommaruga, 2005; Denollet et al, 2005). It is important to consider why the Type D rate is higher within the UK. One possibility is that it could represent a cultural difference between the UK and the rest of Europe. People from the UK are commonly thought to be more socially inhibited and less likely to show emotion than people from other cultures (Todd & Shapiro, 1974). This so-called 'British stiff upper lip'

could lead to increased scores on social inhibition, one of the components of Type D. Although Type D is more than just social inhibition, it is important to note that an increase in social inhibition by a even a couple of points may be enough to classify an individual as Type D, if they have the required level of negative affectivity.

A further reason could be that the prevalence of Type D is higher because the prevalence of CHD is higher in the UK (Allender et al, 2006). At the moment it is unclear if Type D is a predictor of CHD incidence or only a predictor of recovery in patients with already established CHD. If Type D is established as a predictor of CHD then it would be expected for the Type D prevalence rate to be higher in the UK than in other countries. Indeed, one important way in which the research on Type D needs to develop is by the identification of the direction of causality by which Type D affects health. This is needed in order to determine if Type D is an etiological risk factor, as well as a prognostic risk factor for CHD.

An important consideration is the arbitrary nature of the recommended cut-off points which are used to classify Type D. Denollet (2005) has suggested using a cut-off of ≥10 on both the SI and NA subscales of the DS14. This recommendation was based on a median split of the NA and SI scores among the cardiac patients used in the study which validated the DS14 scale (Denollet, 2005). Prior to this there had been no standard way of assessing Type D. It may be important for future research to consider alternative ways of classifying Type D, for example by using more stringent cut-off points (similar to those used in Chapter 7, Section 7.2.1).

The stability of the construct was also investigated. It was found that 76.7% of the healthy population, and 86.4% of the cardiac population were classified in the same way at two time points, three months apart. Pelle et al (in press) report similar findings, with 81% of their cardiac sample being classified in the same way across two time points, also three months apart. These findings therefore suggest that Type D is a relatively stable construct over time. As Type D is intended to represent a personality trait then it would be necessary for the measure to show good stability. However, it is important to note that the classification of approximately 1 in 5 participants has changed over a relatively short period of time (3 months). Indeed, if Type D is intended to represent a stable personality trait then perhaps the stability of the measure should be better. Further research is required to determine the stability of Type D over longer periods of time.

9.2.2 Type D Personality as a Predictor of Outcome in MI Patients

The utility of the Type D construct in predicting psychological outcome in MI patients was investigated in Chapter 8. It was found that Type D was a significant predictor of poor adherence, poor quality of life, and poor functional outcome, after controlling for demographic and clinical factors. Previous research (e.g. Denollet et al, 1996) has also found that Type D is predictive of both mortality and morbidity after controlling for biomedical factors. In the current study, Type D is a stable predictor of psychological morbidity post-MI, increasing the variance explained by traditional demographic and clinical factors by 20-25%. Furthermore, Type D remained a significant predictor after controlling for mood. This is a particularly important finding as some theorists (e.g. Lesperance & Frasure-Smith, 1996) have criticised Type D as being just another measure of negative affect. Similarly, the studies

described in Chapter 5 (section 5.3.2) and 6 (section 6.3.4) also demonstrated that the relationships between Type D and social support, and Type D and health-related behaviour remained significant after controlling for neuroticism. In addition, Denollet et al (2006) found that it was the interaction of social inhibition and negative emotions, rather than negative emotions per se, which predicted poor clinical outcome. Taken together, the findings from the current study, those from Chapter 5 and 6, and the study by Denollet et al (2006) suggest that Type D is not simply another measure of negative affectivity.

9.2.3 Type D Personality Mechanisms of Effect

The studies described in Chapters 5-7 investigated both potential psychosocial (health behaviour, adherence, social support) and psychophysiological (cardiovascular reactivity) mechanisms in populations of healthy young adults. In addition, the clinical study described in Chapter 8 investigated potential mechanisms within a population of MI patients. The findings from these chapters suggest a role for social support, health-related behaviour, cardiovascular reactivity, and illness perceptions in explaining the relationship between Type D and adverse outcome in cardiac patients.

Results from the studies presented in Chapter 5 (section 5.4.2) and 6 (section 6.6.2) demonstrated that Type D personality is associated with low social support. Specifically, Type D individuals were found to experience significantly lower levels of perceived social support (an established risk factor for ill health and cardiac death) compared with non-Type D individuals. Previous research by Denollet et al (1996) demonstrated that people with Type D personality experience higher levels of perceived social alienation and are more socially withdrawn than non-Type D

individuals. The association between Type D and low social support is important as an inverse association has been demonstrated between social support and mortality (Berkman & Syme, 1979), demonstrating that individuals with higher levels of social support have better health outcomes. For example, Type D may limit an individual's access to coping resources, such as supportive social networks. Therefore, Type D individuals may have a poorer outcome due to lower levels of social support. Indeed, the importance of social support has been further demonstrated in a recent study by van den Broek et al (2007) who found that Type D patients without a partner reported more symptoms of anxiety and depression compared to Type D patients with a partner.

The studies described in Chapters 5 (section 5.4.3), 6 (section 6.6.4), and 8 (section 8.3.2) demonstrate that Type D personality is associated with health-related behaviour. Specifically, Type D individuals perform significantly fewer health-related behaviours compared to non-Type D individuals. Findings from a previous study by Pedersen et al (2004) also demonstrated that Type D individuals were more likely to be smokers compared to non-Type D individuals. In addition, evidence for a further behavioural mechanism was recently demonstrated by Schiffer and Denollet (2007) who found that Type D patients were less likely to report their cardiac symptoms compared to non-Type D individuals. Indeed, targeting the maladaptive health behaviour of Type D individuals may be the most obvious and effective way of aiding secondary prevention within this group.

Moreover, linked to the above findings on health-related behaviour, Type D individuals were found to be less adherent to medication than non-Type D individuals. Clearly, if Type D individuals are not taking their medication as directed this will

have a substantial impact on their outcome. Medication adherence therefore represents one very powerful mechanism to explain the link between Type D and adverse clinical outcome in cardiac disease.

The results from the study described in Chapter 7 (section 7.3.2) demonstrated that Type D personality is also related to cardiovascular reactivity to stress. Specifically, male Type D individuals were found to exhibit increased cardiac output during stress compared to non-Type D individuals. Previous research from Habra et al (2001) had demonstrated that the separate components of Type D (social inhibition and negative affectivity) were related to reactivity, but they failed to find an association with the global Type D construct. The results from Chapter 7 therefore demonstrate for the first time that Type D personality is related to heightened cardiac output during acute stress, importantly increased cardiac output has been implicated early in the disease course of hypertension.

Findings from Chapter 8 (section 8.3.4.2.2) demonstrate that Type D may have an affect on outcome through illness perceptions. Indeed, when comparing Type D and non-Type D individuals it was shown that Type D's are significantly different on all illness perceptions. In addition, the hierarchical multiple regression analysis demonstrated a possible mediating role of illness perceptions on the relationship between Type D and quality of life, specifically relating to patients' beliefs about the consequences of illness. It was found that Type D affected social and physical quality of life because Type D individuals believed that their illness would have more serious long-lasting consequences than non-Type D individuals. This may be a particularly important finding in relation to developing interventions for Type D patients. Previous

research by Petrie et al (2002) has identified that it is possible to modify patients'

illness perceptions through intervention, and improve their outcome as a result. Thus,

if the illness perceptions of Type D patients are modified early in the course of their

illness it may be possible to improve their quality of life.

9.3 Mood, Illness Perceptions, and Future-Thinking as Predictors of Psychological Outcome Post-MI

In addition to Type D personality, three other variables emerged as consistent

predictors of outcome. These were; mood, illness perceptions, and future thinking.

As in previous studies, symptoms of anxiety and depression were found to be

important predictors of adherence, quality of life, and functional impairment post-MI.

Earlier work by Lane et al (2000), and Mayou et al (2000), found that both anxiety

and depression predicted quality of life in post-MI patients. The findings from

Chapter 8 (section 8.3.4.4) also demonstrated that symptoms of depression and

anxiety are prevalent in MI patients with 20.3% scoring as possible cases of anxiety,

and 16.1% as possible cases of depression. The current findings therefore highlight

the importance of identifying those patients with symptoms of depression and anxiety,

so that their symptoms can be reduced through therapeutic interventions. Reducing

symptoms of psychological distress is an important way of improving outcome in

post-MI patients.

The findings from Chapter 8 have extended the finding relating to the role of illness

perceptions in post-MI patients. Specifically, perceptions of consequences and

timeline were found to be related to quality of life, psychological distress, and benefit

finding in MI patients. The role of illness perceptions in predicting quality of life of MI patients was also identified by Petrie et al (1996). They also found that patients who believed their MI would have more serious long-lasting consequences had higher levels of illness-related disability and were slower to return to work. Results from Chapter 8 therefore add further evidence relating to the importance of illness perceptions in the recovery of MI patients.

The study described in Chapter 8 is the first to investigate the role of future thinking in a sample of MI patients. The results on the utility of future thinking in predicting quality of life and psychological distress post-MI are promising. Indeed, the findings suggest that a lack of positive future cognitions, and not simply more negative thinking that is predictive of both quality of life and depression post-MI. Previous research on future thinking has found that depressed individuals have difficulties thinking about the future (MacLeod et al, 1997). Indeed, earlier research has found future thinking to be related to depression in a number of patient groups, including those with multiple sclerosis (Moore et al, 2006), and tinnitus (Andersson et al, 2007). The current findings therefore extend the available evidence on future thinking, by identifying for the first time that future thinking is predictive of post-MI depressive symptoms and quality of life. Future research is required to determine if the role of future thinking in predicting outcome post-MI is a robust and replicable finding.

It is important to consider possible reasons as to why future thinking is predictive of quality of life and depression post-MI. For example, should future thinking be viewed as a further cognitive processing mechanism which is associated with adverse or outcome or does it reflect a more of a coping mechanism? The later possibility is

particularly interesting. It could be that future thinking reflects a coping mechanism whereby individuals actively focus on future positive events or things they are looking forward to, such as spending time with family and friends, as a way of getting them through the difficult emotional period that they face post-MI. It appears as though individuals who are able to focus on these positive events, adjust better to their illness, and have improved quality of life, and lower psychological distress post-MI. It is possible that possessing a positive future thinking style may help a person to cope more effectively with stress.

9.4 Theoretical Implications

This section considers the extent to which the above findings are consistent within the self-regulatory framework of Leventhal's CSM (Leventhal et al, 1980). Therefore, the aim of this section is discuss the findings of previous chapters by placing them within a theoretical construct. It is of particular interest to examine the extent to which personality (as assessed by Type D), fits within self-regulatory theory to enhance our understanding of patient recovery. A speculative diagram of Leventhal's CSM with the inclusion of Type D is shown below in Figure 9.1.

Cognitive Processing
Identity, cause,
consequences,
timeline, control

Health Threat: MI
Symptom
perception

**Type D
Personality**

**Behaviour and
Recovery**
HB (e.g. Adherence)
Quality of Life,
Functional Outcome,
Benefit Finding

**Emotional
Processing**
Fear, anxiety,
depression
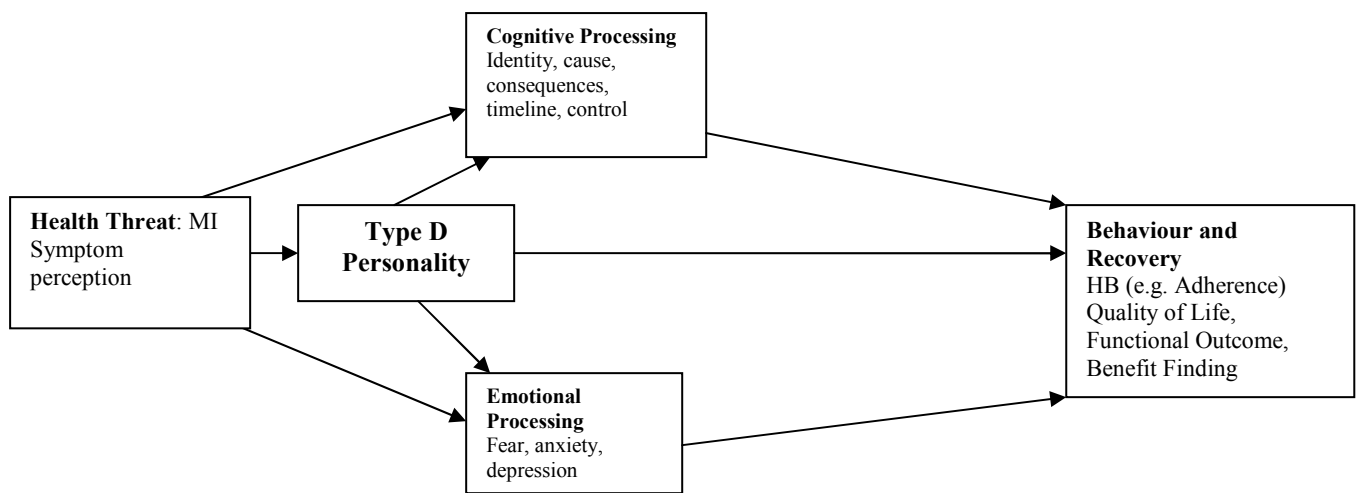
Figure 9.1: Adaptation of Leventhal's common sense model to include Type D personality

According to the CSM, patients' beliefs and perceptions of their illness are important

predictors of behaviour and recovery in MI patients (e.g. Byrne, 1982). Petrie et al

(1996) found that patients' perceptions of their MI assessed at the time of

hospitalisation predicted subsequent attendance at cardiac rehabilitation, return to

work, disability, and sexual dysfunction at three and six months later. Similarly,

findings from the MI study in the current thesis also found that patients' illness

perceptions assessed during hospitalisation predicted quality of life three months post-

MI. These findings are, therefore, supportive of the CSM, as they again point to the

key role that cognitive processing (patients' beliefs and perceptions of their illness)

plays in recovery. Further evidence for the important role of cognitive processing can

be seen from the findings relating to future thinking. Future thinking has been

identified as an important cognitive pathogen in other health contexts. The findings reported in Chapter 8 have extended this evidence by identifying that future thinking predicts outcome in MI patients. Future thinking could therefore be incorporated into the cognitive processing dimension of the CSM, as a further cognitive pathogen, enhancing the ability of the CSM to predict outcome post-MI.

The CSM also describes an important role for emotional processing. A health threat, such as an MI, is thought to change the emotional state of the individual, leading to feelings of fear, anxiety and depression which then drive coping behaviours. Results from the MI study in this thesis also demonstrate the importance of depression and anxiety in predicting recovery post-MI. This lends further support for the parallel processing approach of the CSM which emphasises the importance of both cognitive and emotional factors.

It is of particular interest to examine how Type D personality fits within the CSM. As shown in Figure 9.1 personality (including Type D) may play an important role early on in the CSM. Within the context of this thesis, Type D was related to both cognitive and emotional processing. Type D could therefore be seen as a dispositional factor that will influence the cognitive and emotional processing responses of an individual following a health threat. For example, after an MI (health threat) a Type D individual experiences a greater number of symptoms of depression and anxiety, and has more negative perceptions of their illness. These negative perceptions then influence behaviour and recovery post-MI.

The findings of this thesis demonstrate the utility of the CSM model in investigating the role of personality and illness-related cognitions in predicting outcome post-MI. Further evidence was found for the original CSM by identifying the importance of patients' perceptions of their illness in predicting outcome. The findings also suggest that future thinking may be incorporated into model, as a further example of the importance of cognitive processing in predicting outcome. The results also suggest that the addition of personality to the CSM may enhance its ability to predict outcome post-MI. Specifically, Type D was found to be related to patients' perceptions of their MI, and may therefore represent an important distal factor which could be incorporated into the CSM after the initial health threat. Personality will then play an important role in determining how an individual processes the health threat in both a cognitive and emotional way.

It is also important to consider these findings in light of other self-regulation models. For example, Carver and Scheier's (1998) model which was described in detail in Chapter 3 (section 3.2.1) may also provide a useful theoretical context by which to interpret the results of this thesis. For example, the role of future thinking in predicting outcome may be better understood from this view point. Individuals who possess positive future thinking compared to those who possess negative future thinking may have greater confidence in their ability to attain goals, and avoid anti-goals. In addition, they may be better at identifying suitable goals and more persistent in pursuing these goals. Indeed, the future thinking task itself can be conceptualised in terms of Carver and Scheier's model. Participants are asked to generate potential future events, essentially these can be viewed as goals, and anti-goals that they are either looking forward to, or are worried about (O'Connor & Cassidy, 2007). In

addition, Carver and Scheier's model suggests that those individuals who are high on hopelessness have difficulty identifying goals in the form of specific, future positive expectations. This may be because they have repeatedly failed to meet previous goals and have learned that there is no relationship between their behaviour and outcomes. As a result, their generalised motivation and expectancies are much reduced. This may lead to possible depression and poor quality of life.

9.5 Therapeutic Implications

This section highlights the ways in which the findings relating to predictors of outcome post-MI may be used to aid the secondary prevention of CHD. Specifically, the current section concentrates on how the findings related to patients' personality, mood, and cognition could aid treatment.

This thesis has highlighted the importance of patients' mood and cognitions in predicting their psychological outcome post-MI. In terms of secondary prevention of CHD, interventions could be developed to target cognitions and mood. An assessment of patients' levels of anxiety and depression could be done as part of their routine care in hospital using simple questionnaires such as HADS or the Beck Depression Inventory. This might draw attention to patients in need of particular help and allow early treatment or counselling referral in order to avoid later problems. Similarly, assessing patients for Type D personality could help to identify patients who are at high risk of mortality and morbidity. The DS14 is easy and quick to administer, and could be performed alongside an assessment of mood as part of early routine care in hospital for cardiac patients.

Research has shown that reducing emotional distress in patients with CHD improves prognosis. For example, Denollet and Brutsaert (2001) investigated whether cardiac rehabilitation reduces emotional distress in the short-term and mortality in the long-term. They compared 150 men with CHD, who either received rehabilitation or standard medical care. At the end of the 3-month trial, rehabilitation patients reported significantly more improvement in negative affect, and significantly less deterioration in negative affect. It was also found that those patients who had experienced a reduction in negative affect were significantly less likely to have died at 9 year follow-up. Therefore, it can be seen that reducing the negative affect of CHD patients is effective in improving their prognosis.

Further research investigating patients' perceptions might focus on developing an intervention to change patients' maladaptive beliefs about the effects of their illness. For example, Petrie et al (2002) demonstrated that it is possible to alter the illness perceptions of MI patients, thus offering a potential route for interventions. They carried out a randomised control and found that a brief hospital intervention with patients aimed at altering their perceptions about their MI was successful in changing patients' view of their MI. This change meant that these patients returned to work more quickly and experienced fewer angina symptoms compared to those patients in the control condition. Cognitive behaviour therapy has proved useful in treating a variety of conditions including anxiety and depression. This might provide a useful approach to help to change patients' maladaptive perceptions about their heart disease.

9.6 Directions for Future Research

This section outlines directions for future research in light of the main findings of this thesis. The association between Type D and outcome has been established previously by Denollet and colleagues, and warrants further investigation in the future. The research described above has demonstrated that Type D is associated with health-related behaviour, social support, cardiovascular reactivity, and illness perceptions. By identifying the possible mechanisms which may be responsible for the link between Type D and poor prognosis it may be possible to identify how this risk factor can be modified, in order to enhance secondary prevention in these high-risk patients. For example, in light of the findings of this thesis it may be possible for interventions to target patients' illness perceptions and health-related behaviour as one way of improving Type D patient outcome. Indeed, the Type D construct has been previously criticised as not providing an obvious route for intervention (Lesperance & Frasure-Smith, 1999). It is therefore important that future research aims to develop interventions that either improves the outcome of Type D patients, or interventions that detect the presence of Type D at an early stage and attempt to modify either the social inhibition and/or negative affectivity components.

Specifically, there is a need to conduct intervention trials that target Type D in order to enhance secondary prevention in this subset of CHD patients. Recent research has demonstrated that a reduction in negative emotions can lead to improved prognosis (e.g. Denollet & Brutsaert, 2001). Although social inhibition may be less amenable to change, it is important to note that a reduction in negative affectivity (below the standardised cut-off of ≤10) would make the difference between whether a patient is classified as Type D or not. Therefore, the risk profile of the patient would change,

hence leading to a reduced risk of adverse clinical outcome. As outlined by Ketterer et al (2000) if a risk factor cannot be modified, it has no clinical utility. It is therefore crucial for interventions to be developed.

It will also be important to identify in the context of epidemiological studies whether Type D is not only a prognostic but also an etiological risk factor leading to the development of CHD in previously healthy individuals. In order to do this, it will be necessary to follow a healthy cohort over time. It is also important to determine further mechanisms (both psychosocial and psychophysiological) which may explain the link between Type D and adverse clinical outcome in cardiac patients. Furthermore, it is important to determine if Type D has an important role in other non-cardiac conditions. To-date, only one study has demonstrated an association between Type D and another illness. Denollet (1998) demonstrated that Type D was an independent predictor of the development of cancer in patients with established CHD. Therefore, it is important to further examine the role of Type D in the development of cancer, and other non-cardiac conditions. There is no reason to believe that Type D would be a cardiac specific pathogen.

Further research is also required to determine if future thinking is a reliable prognostic risk factor in cardiac disease. If it is, then future thinking could represent a possible target for interventions and also for risk assessment, by identifying the types of cognitions (i.e. goals) that should be targeted clinically. Interventions aimed at helping individuals to generate plans, hopes, and goals for the future may lead to improvements in future thinking and outcome.

9.7 Limitations

Several limitations specific to the measures and procedure used in each study have already been noted in the Discussion sections of Chapters 5-8. The following section outlines some broader limitations of the work.

Each of the studies described in this thesis has relied on the use of self-report measures, and may therefore be subject to self presentation and recall biases which are common problems faced when using self-report measures. For example, the assessment of medication adherence is known to be affected by recall bias, indeed it has been estimated that self reports may underestimate the true extent of non-adherence by approximately 20% (Horne, 2000). In order to encourage patients to be as honest as possible without concern that their answers might influence their treatment, patients were assured that the information they gave would not be entered into their medical notes and that their doctor would not see their responses. Even so, this study (and those undertaken with the young healthy populations) were subject to the risk of interviewer bias whereby patients seek to offer answers they believe will please the interviewer, and recall bias involving over or underestimation of behaviours, such as medication adherence.

The length of follow-up used in the study described in Chapter 8, and Study 6.1 was three months (however, this was dictated by demands of the PhD timescale). This is a relatively short time period, and can only allow conclusions to be drawn regarding the short-term recovery of MI patients. For example, it may be that the duration of follow-up was insufficient to detect effects which may be present at longer follow-up periods. Furthermore, the use of a three month follow-up in Study 6.1 only allows for

the stability of Type D to be assessed over a relatively short period of time. If Type D is a stable personality trait then it is important to determine stability over a longer period of time.

The measurement of health-related behaviour represents a further weakness of this thesis. Indeed, the findings related to Type D and health behaviour are limited by the measures of health-related behaviours that were available in the Health Psychology literature. It is important to question whether retrospective self-report questionnaires are a reliable way to assess health behaviour. When selecting the measures for inclusion in these studies it was difficult to find a recognised measure of health behaviour as little or no reliability and validity data exists on such measures. Furthermore, many of these questionnaires utilise a yes/no scoring response which may not be suitable for assessing something as complex as behaviour. The lack of reliable, well-validated measures of health behaviour represents a problem for the field of Health Psychology as a whole. Future research is required which investigates the reliability and validity of measures of health-behaviour.

It is also important to consider the response rates of the samples in which a follow-up phase was used. For Study 6.1 (section 6.2.1) the response rate was 50.9%. Similarly, in Chapter 7 (section 7.2.1) only 50% of those invited to take part in the experimental phase did so. In addition, the response rate in the MI study was 63% (section 8.2.1). These response rates indicate that a significant number of participants did not participate in the follow-up phases of these studies. This may have led to the under-representation of certain groups of participants in the analysis. For example, in the MI study may have resulted in an under representation of patients with poor health status.

The MI study (Chapter 8), and the study on Type D personality and cardiovascular reactivity (Chapter 7) represent studies in which sample size may be a possible limitations. Eighty-four participants took part in the reactivity study which represents a good sample size. However, the analyses were then conducted separately for males and females, giving two samples of 42 participants, which represents a relatively small sample size for these two groups. Furthermore, 131 participants took part in the follow-up stage of the MI study. Although this is a reasonable number, a larger number would have allowed for the inclusion of more variables in the regression analyses. This would have been an advantage as possible interaction effects could have then been explored.

9.8 Conclusion: What Did This Thesis Add?

The studies described within this thesis have extended the evidence relating to predictors of psychological outcome in several key ways:

- The prevalence of Type D personality in healthy individuals from the UK and Ireland (38.5%) has been established for the first time.

- Type D individuals were found to experience significantly lower levels of perceived social support compared to non-Type D individuals, even after controlling for neuroticism

- For the first time a relationship between Type D and health-related behaviour was established. Specifically, Type D individuals perform significantly fewer health-related behaviours than non-Type D's, even after controlling for neuroticism.

- Type D was found to be a relatively stable construct in healthy individuals with 76.7% of individuals being consistently classified as Type D or non-Type D over 3 months.

- Type D individuals experience significantly higher feelings of stress during acute stress compared to non-Type D individuals.

- A relationship between Type D and cardiovascular reactivity to stress was established for the first time. Type D males have significantly higher cardiac output during stress compared to non-Type D individuals.

- The prevalence rate of Type D (33.9%) in a Scottish cardiac population has been identified for the first time.

- For the first time a relationship between Type D and illness perceptions has been identified, with Type D individuals having significantly different illness perceptions on all measures of the Illness Perceptions Questionnaire compared to non-Type D individuals.

- Chapter 8 identified a relationship between Type D and medication adherence for the first time. Type D individuals are less adherent to medication compared to non-Type D individuals.

- Type D is predictive of poor adherence, poor quality of life, and poor functional outcome after controlling for mood, and demographic and clinical factors.

- The relationship between Type D and quality of life is mediated by illness perceptions.

- Future thinking has been found to predict quality of life and mood in cardiac patients for this first time.

- The role of illness perceptions in predicting outcome post-MI has been confirmed; with illness perceptions predicting quality of life, mood and benefit finding.

- The importance of mood in predicting outcome post-MI has been confirmed with depression and anxiety predicting adherence, quality of life and functional outcome post-MI.

Overall, the thesis has (i) established the prevalence of Type D personality in the UK to be 38.5% in the healthy population, and 33.9% in the cardiac population; (ii) found that Type D is predictive of adherence, quality of life, and functional impairment in post-MI patients after controlling for mood, demographics, and clinical factors; (iii) established five possible mechanisms (health-related behaviour, adherence, social

support, cardiovascular reactivity, and illness perceptions) by which Type D may lead to adverse outcome in cardiac patients; (iv) confirmed the importance of mood (depression and anxiety) in predicting quality of life and functional impairment post-MI; (v) confirmed the importance of illness perceptions in predicting quality of life post-MI; and (vi) demonstrated for the first time that future thinking predicts quality of life, functional impairment and depression post-MI.

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Appendix 1: Type D Personality Scale

Below are a number of statements that people often use to describe themselves. Please read each statement and then circle the appropriate number next to the statement to indicate your answer. There are no right or wrong answers. Your own impression is the only thing that matters

0=FALSE   1=RATHER FALSE   2=NEUTRAL   3=RATHER TRUE   4=TRUE

1. I make contact easily when I meet people	0	1	2	3	4
2. I often make a fuss about unimportant things	0	1	2	3	4
3. I often talk to strangers	0	1	2	3	4
4. I often feel unhappy	0	1	2	3	4
5. I am often irritated	0	1	2	3	4
6. I often feel inhibited in social interactions	0	1	2	3	4
7. I take a gloomy view of things	0	1	2	3	4
8. I find it hard to start a conversation	0	1	2	3	4
9. I am often in a bad mood	0	1	2	3	4
10. I am a closed kind of person	0	1	2	3	4
11. I would rather keep other people at a distance	0	1	2	3	4
12. I often find myself worrying about something	0	1	2	3	4
13. I am often down in the dumps	0	1	2	3	4
14. When socializing, I don't find the right things to talk about	0	1	2	3	4

Appendix 2: Quality of Social Network and Social Support Scale

Please answer each question by circling the response that most closely applies to you

1. How strongly do you feel attached to your close family?
Very Strongly   Quite Strongly   Quite loosely   Not at all

2. Do you find it difficult to know where you are with your close family, with respect to their points of view and opinions?
Often   Sometimes   Never

3. Do you feel that you, by and large, can be yourself in relation to your close family?
Always   Usually   Seldom or never

4. Do you feel that your close family puts reasonable weight upon your opinions?
Always   Usually   Seldom or never

5. Do you feel that you can count on your friends in the future?
Very sure   Quite sure   Not sure

6. Do you think you would be disappointed if you knew what your friends really thought about you?
Yes   Maybe   No

7. Do you feel closely attached to your friends?
Always   Usually   Seldom or never

8. Do you feel that your friends put reasonable weight upon your opinions?
Always   Usually   Seldom or never

9. Do you feel apart even among friends?
Often   Sometimes   Never

Appendix 3: Social Support Survey- Medical Outcomes Study

People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it? Circle one number on each line.

	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Emotional/informational support					
Someone you can count on to listen to you when you need to talk	1	2	3	4	5
Someone to give you information to help you understand a situation	1	2	3	4	5
Someone to give you good advice about a crisis	1	2	3	4	5
Someone to confide in or talk to about yourself or your problems	1	2	3	4	5
Someone whose advice you really want	1	2	3	4	5
Someone to share your most private worries and fears with	1	2	3	4	5
Someone to turn to for suggestions about how to deal with a personal problem	1	2	3	4	5
Someone who understands your problems	1	2	3	4	5
Tangible support					
Someone to help you if you were confined to bed	1	2	3	4	5
Someone to take you to the doctor if you needed it	1	2	3	4	5
Someone to prepare your meals if you were unable to do it yourself	1	2	3	4	5
Someone to help with daily chores if you were sick	1	2	3	4	5
Affectionate support					
Someone who shows you love and affection	1	2	3	4	5
Someone to love and make you feel wanted	1	2	3	4	5
Someone who hugs you	1	2	3	4	5
Positive social interaction					
Someone to have a good time with	1	2	3	4	5
Someone to get together with for relaxation	1	2	3	4	5
Someone to do something enjoyable with	1	2	3	4	5
Additional item					
Someone to do things with to help you get your mind off things	1	2	3	4	5

Appendix 4: Neuroticism Scale

Please answer each question by putting a circle around the Yes or No. There are no right or wrong answers. Work quickly and do not think too long about the exact meaning of the questions.		
1) Does your mood go up and down?	No	Yes
2) Do you ever feel 'just miserable' for no reason	No	Yes
3) Are you an irritable person?	No	Yes
4) Are your feelings easily hurt	No	Yes
5) Do you often feel 'fed up'?	No	Yes
6) Would you call yourself a nervous person?	No	Yes
7) Are you a worrier	No	Yes
8) Would you call yourself tense or 'highly-strung'	No	Yes
9) Do you worry too long after an embarrassing incident?	No	Yes
10) Do you suffer from nerves?	No	Yes
11) Do you often feel lonely?	No	Yes
12) Are you often troubled by feelings of guilt?	No	Yes

Appendix 5: Future Thinking Task

Instructions for FAS:

'First I would like you to think of as many words beginning with a certain letter of the alphabet. I will ask you to do this for 3 different letters. You will have a minute in each case to think of as many words as you can beginning with that letter. Please say the words and I will write them down. That words can be anything that comes to mind except that they shouldn't be proper names, that is names of people or places, or sequences involving the same basic word, for example, run, runner, running, and so on. I want you to give me as many words as you can beginning with the letter F.'

(participants are asked to do this for the letters F, A and S in that fixed order and given one minute to think of words for each of the letters). The researcher writes down the words, or if the participant is going to fast for this, just indicates on the scoring sheet that a valid response was given.

Instructions for FTT:

'Now I'd like you to think about the things that might happen in the future. I will give you 3 different time points in the future, one at a time, and I'd like you to try to think of as many things as you can. It doesn't matter whether the things are trivial or important, just say what comes to mind. But, they should be things that you think will definitely happen or are at least quite likely to happen. If you can't think of anything or if you can't think of many things, that's fine, but just keep trying until the time limit is up.'

'First I'm going to ask you to think of positive things in the future. So I'd like you to try to think of things that you are looking forward to, in other words things that you enjoy. So, I want you to give me as many things as you can that you're looking forward to over the next week including today.'

(R gives one minute and writes down as close to verbatim as time allows what the participant says)

'Now I'd like you to do the same but this time I want you to give me things that you're looking forward to over the next year'

(R does the same as for one week)

'Now I'd like you to do the same but this time I want you to give me things that you're looking forward to over the next five to ten years'

(R does the same as previous)

'Now I'd like you to think of the things that you're worried about or not looking forward to, in other words, things that you would rather not be the case or rather not happen. So, I want you to think of as many things as you can that you're worried about or not looking forward to over the next week including today'

(R does the same as previous)

'Now I want you to give me things that you're worried about or not looking forward to over the next year'

(R does the same as previous)

'Finally, I want you to give me as many things as you can that you're worried about or not looking forward to in the next five to ten years'

(R does the same as previous)

The order of presentation of negative and positive conditions should be counterbalanced across participants, although within each condition the time periods are always presented in the same order (week, year, 5-10 years).

If participant says during the thinking time that they can't think of anything or, for example that there is nothing that they are looking forward to over the next week, say 'that's ok, but just keep trying to think until I tell you to stop.'

Appendix 6: Life Orientation Task Revised

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no 'correct' or 'incorrect' answers. Answer according to your own feelings, rather than how you think 'most people' would answer.

A=I agree a lot
B=I agree a little
C=I neither agree nor disagree
D=I disagree a little
E=I disagree a lot

1. In uncertain times, I usually expect the best	A	B	C	D	E
2. It's easy for me to relax	A	B	C	D	E
3. If something can go wrong for me it will	A	B	C	D	E
4. I'm always optimistic about my future	A	B	C	D	E
5. I enjoy my friends a lot	A	B	C	D	E
6. It's important for me to keep busy	A	B	C	D	E
7. I hardly ever expect things to go my way	A	B	C	D	E
8. I don't get upset too easily	A	B	C	D	E
9. I rarely count on good things happening to me	A	B	C	D	E
10. Overall, I expect more good things to happen to me than bad	A	B	C	D	E

Appendix 7: The Recovery Locus of Control Scale

These are statements other people have made about their recovery. Please indicate the extent to which you agree or disagree with them

	Strongly Agree	Agree	Uncertain	Disagree	Strongly disagree
How I manage in the future depends on me, not on what other people can do for me					
It's often best just to wait and see what happens					
It's what I do to help myself that's really going to make all the difference					
My own efforts are not very important, my recovery really depends on others					
It's up to me to make sure that I makes the best recovery possible under the circumstances					
My own contribution to my recovery doesn't amount to much					
Getting better now is a matter of my own determination rather than anything else					
I have little or no control over my progress from now on					
It doesn't matter how much help you get, in the end it's your own efforts that count					

Appendix 8: The Beliefs about Medicines Questionnaire

<div style="border:1px solid black">

YOUR VIEWS ABOUT
MEDICINES IN GENERAL

</div>

- These are statements that other people have made about medicines in general
- Please show how much you agree or disagree with them by ticking the appropriate box.

	Views about MEDICINES IN GENERAL	Strongly agree	Agree	Uncertain	Disagree	Strongly Disagree
BG1	Doctors use too many medicines					
BG2	People who take medicines should stop their treatment for a while every now and again					
BG3	Most medicines are addictive					
BG4	Natural remedies are safer than medicines					
BG5	Medicines do more harm than good					
BG6	All medicines are poisonous					
BG7	Doctors place too much trust on medicines					
BG8	If doctors had more time with patients they would prescribe fewer medicines					

	YOUR VIEWS ABOUT
MEDICINES PRESCRIBED FOR YOU

- We would like to ask you about your personal views about medicines prescribed for you
- These are statements other people have made about their medicines
- Please show how much you agree or disagree with them by ticking the appropriate box

	There are no right or wrong answers.
We are interested in your personal views

	Views about MEDICINES PRESCRIBED FOR YOU	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
BS1	My health, at present depends on my medicines					
BS2	Having to take my medicines worries me					
BS3	My life would be impossible without my medicines					
BS4	I sometimes worry about the long-term effects of my medicines					
BS5	Without my medicines I would be very ill					
BS6	My medicines are a mystery to me					
BS7	My health in the future will depend on my medicines					
BS8	My medicines disrupt my life					
BS9	I sometimes worry about becoming too dependent on my medicines					
BS10	My medicines protect me from becoming worse					

Appendix 9: The Brief Illness Perception Questionnaire

How much does your heart condition affect your life?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

no affect
at all

Severely affects
my life

How long do you think your heart condition will continue?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

a very short
time

forever

How much control do you feel you have over your heart condition?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

absolutely
no control

extreme amount
of control

How much do you think your treatment can help your heart condition?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

not at all

extremely
helpful

How much do you experience symptoms from your heart condition?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

no symptoms
at all

many severe
symptoms

How concerned are you about your heart condition?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

not at all
concerned

extremely
concerned

How well do you feel you understand your heart condition?

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

don't understand
at all

understand
very clearly

How much does your heart condition affect you emotionally? (e.g. does it make you angry, scared, upset or depressed?)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

not at all
affected emotionally

extremely affected
emotionally

Please list in rank-order the three most important factors that you believe caused <u>your illness</u>

1.

2.

3.

Appendix 10: Roles and Goals Questionnaire

In this questionnaire, we are interested in finding out your attitudes towards various aspects of your life. For example, whether you have any current interests and hobbies, relationships that mean a lot to you, and so on.

Please go through each page and make sure that you fill in every area accordingly. For each question, please circle the appropriate number.

A. <u>PRESENT EMPLOYMENT</u> (include part-time or voluntary work.)

Please state what this is (if applicable)....................................

	very little	moderate amount	quite a lot	a great deal
a. How much does this work make you feel good as a person?	1	2	3	4
b. How much energy and effort do you put into this work?	1	2	3	4
c. How successful will you be in this work?	1	2	3	4
d. To what extent does being successful in other areas of your life depend on your being successful at work?	1	2	3	4
e. To what extent would life feel meaningless or unhappy without it?	1	2	3	4

B. <u>YOUR MOST IMPORTANT CURRENT HOBBY OR INTEREST</u> (for example, reading, knitting, sports, DIY etc.)

Please state what this is (if applicable)....................................

	very little	moderate amount	quite a lot	a great deal
a. How much does this hobby make you feel good as a person?	1	2	3	4
b. How much energy and effort do you put into this hobby?	1	2	3	4

c. How successful do you think
  you will be in this hobby?   1   2   3   4

d. To what extent does being
  successful in other areas
  in your life depend on your
  doing well in this hobby?   1   2   3   4

e. To what extent would life
  feel meaningless or
  unhappy without it?   1   2   3   4

C. YOUR MOST IMPORTANT CURRENT RELATIONSHIP

Please state who this is with (e.g. spouse, son or daughter, close friend,

etc.)..

	very little	moderate amount	quite a lot	a great deal
a. How much does this relationship make you feel good as a person?	1	2	3	4
b. How much energy and effort do you put into this relationship?	1	2	3	4
c. How successful do you think this relationships will be?	1	2	3	4
d. To what extent does being successful in other areas of your life depend on your doing well in this relationship?	1	2	3	4
e. To what extent would life feel meaningless or unhappy without it?	1	2	3	4

D. INDEPENDENT LIVING AND HEALTH

1. Has there been any significant deterioration
   in your physical or mental health? (please circle)   **YES   NO**

If applicable, please state what this is and write down the name of the

illness (if known)..

	very little	moderate amount	quite a lot	a great deal
a. How much does being in good health make you feel as a person?	1	2	3	4
b. How much energy and effort do you put into keeping good health?	1	2	3	4
c. What is the probability of your being in reasonable health in the future?	1	2	3	4
d. To what extent does being successful in other areas of your life depend on you being in reasonable health?	1	2	3	4
e. To what extent would life feel meaningless or unhappy without it?	1	2	3	4

E. <u>OTHER GOALS</u>

Is there another important goal or relationship
in your life in addition to those mentioned above?
(please circle)   **YES   NO**

Please state what this is (if applicable)..................................

	very little	moderate amount	quite a lot	a great deal
a. How much does this goal make you feel good as a person?	1	2	3	4
b. How much energy and effort do you put into it?	1	2	3	4
c. What is the probability of your being successful in this goal?	1	2	3	4
d. To what extent does being successful in other areas of your life depend on you being in this goal?	1	2	3	4
e. To what extent would life feel meaningless or unhappy without it?	1	2	3	4

Appendix 11: Stress Arousal Checklist

Please read the following words and for each, tick the box that best describes how you feel at the moment

	Definitely Feel	Slightly Feel	Cannot Decide	Definitely Do Not Feel
Tense				
Worried				
Apprehensive				
Bothered				
Unease				
Dejected				
Up-tight				
Jittery				
Nervous				
Distressed				
Fearful				
Peaceful				
Relaxed				
Cheerful				
Contented				
Pleasant				
Comfortable				
Calm				
Rested				

Appendix 12: The Hospital Anxiety and Depression Scale

Read the following items and place a CROSS in the box opposite the reply which comes closest to how you have been feeling of late, ONLY ONE CROSS PER QUESTION.

a. I feel tense or wound up:
Most of the time…………. ☐

A lot of the time…………. ☐

Time to time, occasionally. ☐

Not at all………………… ☐

g. I can sit at ease and feel relaxed:
Definitely……………. ☐

Usually………………. ☐

Not often……………… ☐

Not at all……………… ☐

b. I enjoy the things I used to
Definitely as much……….. ☐

Not quite so much………… ☐

Only a little……………… ☐

Not at all………………… ☐

h. I feel as if I am lacking in energy:
Nearly all of the time…. ☐

Very often……………. ☐

Sometimes ☐

Not at all ☐

c. I get a sort of frightened feeling as if something awful is about to happen:
Most of the time…………. ☐

A lot of the time…………. ☐

Time to time, occasionally. ☐

Not at all………………… ☐

i. I get a sort of frightened feeling like butterflies in the stomach:
Not at all……………… ☐

Not often……………… ☐

Sometimes……………. ☐

Most of the time……… ☐

d. I can laugh and see the funny side of things
As much as I always could. ☐

Not quite so much………… ☐

Definitely not so much…… ☐

Not at all………………… ☐

j. I have lost interest in my appearance:
Definitely……………. ☐

I don't take as much care as I should………. ☐

I may not take quite as much care…………… ☐

I take just as much care as ever……………… ☐

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e. Worrying thoughts go through my mind

A great deal of the time…………☐

A lot of the time………………☐

From time to time, not too often..☐

Only occasionally………………☐

f. I feel cheerful:

Not at all…………………………☐

Not often…………………………☐

Sometimes………………………☐

Most of the time…………………☐

m. I get sudden feelings of panic:

Very often indeed………………☐

Quite often………………………☐

Not very often…………………☐

Not at all…………………………☐

k. I feel restless as if I have to be on the move

Very much indeed…………….☐

Quite a lot……………………☐

Not very often…………………☐

Not at all………………………☐

l. I look forward with enjoyment to things

As much as I ever did………☐

Rather less than I used to……☐

Definitely less than I used to.☐

Hardly at all……………………☐

n. I can enjoy a good book or radio or TV programme

Often…………………………☐

Sometimes……………………☐

Not often………………………☐

Very seldom…………………☐

Appendix 13: General Preventive Health Behaviours Checklist

Which of the following activities do you generally undertake or engage in? Please respond by underlining the number which best represents the extent to which you undertake or engage in each activity.

0= No, do not do 1= Sometimes 2= Yes, always or almost always

1. Avoid drinking and driving	0	1	2
2. Wear a seat belt when in the car	0	1	2
3. Do things in moderation	0	1	2
4. Get enough relaxation	0	1	2
5. Check safety of electrical appliances	0	1	2
6. Avoid overworking	0	1	2
7. Fix broken things around the home	0	1	2
8. Eat sensibly	0	1	2
9. Maintain contact with friends and relatives	0	1	2
10. Destroy old or unused medicines	0	1	2
11. Regularly eat breakfast	0	1	2
12. Practice safe sex	0	1	2
13. Avoid crossing the street against the traffic lights	0	1	2
14. Keep a first-aid kit in the home	0	1	2
15. Get enough sleep	0	1	2
16. Keep emergency phone numbers	0	1	2
17. Avoid over-the-counter medicines	0	1	2
18. Spend time out of doors everyday	0	1	2
19. Do not smoke	0	1	2
20. Get enough exercise	0	1	2

21.Pray or live by the principles of religion	0	1	2
22. Avoid letting things get me down	0	1	2
23. Avoid eating snacks	0	1	2
24. Limit alcohol intake	0	1	2
25. Limit certain foods, e.g. fat, sugar	0	1	2
26. Control my weight	0	1	2
27. Get a regular medical check-up	0	1	2
28. Get a regular dental check-up	0	1	2
29. Take dietary supplements or vitamins	0	1	2

Appendix 14: General Preventive Health Behaviours Checklist (Brief)

Which of the following activities do you generally undertake or engage in? Please respond by circling the number which best represents the extent to which you undertake or engage in each activity:

0=Do not do   1=Sometimes   2= Yes, always or almost always

1. Eat sensibly	0	1	2
2. Avoid crossing the street against the traffic lights	0	1	2
3. Get enough sleep	0	1	2
4. Spend time out of doors everyday	0	1	2
5. Do not smoke	0	1	2
6. Get enough exercise	0	1	2
7. Avoid letting things get me down	0	1	2
8. Get a regular medical check-up	0	1	2

Appendix 15: Health Behaviour Scale

Looking back on an average week, please indicate how often you did each of the following behaviours: (Please tick the appropriate box)

	Never	Once a month	Once a week	2-3 times a week	4-5 times per week	Every day
Strenuous or moderately strenuous physical exercise (e.g. brisk walking)						
Take vitamins						
Take alternative or complementary remedies						
Eat the recommended 5+ portions of fruit and vegetables each day						
Eat breakfast						
Eat fried food						
Drink alcohol						
Get 7-8 hours sleep						

In an average week, how many minutes would you spend doing strenuous or moderately strenuous exercise (so you sweat)?	minutes per week	
Do you usually use fat-reduced milk (e.g. trim milk)?	Yes	No
What do you normally use as a choice of spread?	Butter	Margarine

Smoking Behaviour

1. Do you ever smoke?   Yes   No
2. Over the last week, on average how many cigarettes have you smoked? _____
3. On average how many cigarettes have you smoked each day? _____
4. Over the last week, how much have you been craving cigarettes?
        1   2   3   4   5
Not at all   Extremely

Sleeping Behaviour

1. On average how many hours have you slept per night? _____ (hours)
2. How does this amount related to your usual sleeping pattern? (Please circle)
        Much less than usual
        Less than usual
        Same as usual
        More than usual
        Much more than usual

Alcohol Consumption

1. Do you ever drink alcohol?   Yes   No
2. Over the last week, on average how much have you drunk? _____
3. On average how many alcoholic drinks have you had each day? _____
4. Over the last week, how much have you been craving alcohol?
        1   2   3   4   5
Not at all   Extremely

Exercise Behaviour (over the last week)

1. How many hours have you spent exercising? (e.g. aerobics, walking, running) _____ (hours)
2. How does this amount relate to your usual exercise behaviour? (Please circle)
        Much less than usual
        Less than usual
        Same as usual
        More than usual
        Much more than usual

Appendix 17: Benefit Finding

Having a heart attack….

1. Has led me to be more accepting of things

I disagree a lot   I disagree a little   I agree a little   I agree a lot

2. Has taught me how to adjust to things I cannot change

I disagree a lot   I disagree a little   I agree a little   I agree a lot

3. Has helped me take things as they come

I disagree a lot   I disagree a little   I agree a little   I agree a lot

4. Has brought my family closer together

I disagree a lot   I disagree a little   I agree a little   I agree a lot

5. Has made me more sensitive to family issues

I disagree a lot   I disagree a little   I agree a little   I agree a lot

6. Has taught me that everybody has a purpose in life

I disagree a lot   I disagree a little   I agree a little   I agree a lot

7. Has shown me that all people need to be loved

I disagree a lot   I disagree a little   I agree a little   I agree a lot

8. Has made me realise the importance of planning for my family's future

I disagree a lot   I disagree a little   I agree a little   I agree a lot

9. Has made me more aware and concerned for the future of all human beings

I disagree a lot   I disagree a little   I agree a little   I agree a lot

10. Has taught me to be patient

I disagree a lot   I disagree a little   I agree a little   I agree a lot

11. Has led me to deal better with stress and problems

I disagree a lot   I disagree a little   I agree a little   I agree a lot

12. Has led me to meet people who have become some of my best friends

I disagree a lot   I disagree a little   I agree a little   I agree a lot

13. Has contributed to my overall emotional and spiritual growth

I disagree a lot   I disagree a little   I agree a little   I agree a lot

14. Has helped me become more aware of the love and support available from other people

I disagree a lot   I disagree a little   I agree a little   I agree a lot

15. Has helped me realise who my friends are

I disagree a lot   I disagree a little   I agree a little   I agree a lot

16. Has helped me become more focused on priorities, with a deeper sense of purpose in life

I disagree a lot   I disagree a little   I agree a little   I agree a lot

17. Has helped me become a stronger person, more able to cope effectively with future life challenges

I disagree a lot   I disagree a little   I agree a little   I agree a lot

Appendix 18: MacNew Quality of Life Scale

We would now like to ask you some questions about how you have been feeling **DURING THE LAST 2 WEEKS**

Please circle your answer

1. In general, how much of the time during the last 2 weeks have you felt frustrated, impatient or angry?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

2. How often during the last 2 weeks have you felt worthless or inadequate?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

3. In the last 2 weeks, how much of your time did you feel very confident and sure that you could deal with your heart problem?
None of the time
A little of the time
Some of the time
A good bit of the time
Most of the time
Almost all of the time
All of the time

4. In general how much of the time did you feel discouraged or down in the dumps during the last 2 weeks?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

5. How much of the time during the last 2 weeks did you feel relaxed and free of tension?
None of the time
A little of the time
Some of the time
A good bit of the time
Most of the time
Almost all of the time
All of the time

6. How often during the last 2 weeks have You felt worn out or low in energy?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

7. How happy, satisfied, or pleased have you been with your personal life during the last 2 weeks?
Very dissatisfied, unhappy most of the time
Generally dissatisfies, unhappy
Somewhat dissatisfied, unhappy
Generally satisfied, pleased
Happy most of the time
Very happy most of the time
Extremely happy, could not have been more satisfied or pleased

8.In general, how often during the last 2 Weeks have you felt restless, or as if you were having difficulty trying to calm down
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

9. How much shortness of breath have you experienced during the last 2 weeks while you were doing your day-to-day physical activities?

Extreme shortness of breath
Very short of breath
Quite a bit of shortness of breath
Moderate shortness of breath
Some shortness of breath
A little shortness of breath
No shortness of breath

10. How often during the last 2 weeks have you felt tearful, or like crying?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

11. How often during the last 2 weeks have you felt as if you are more dependent than you were before your heart problem?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

12. How often during the last 2 weeks have you felt you were unable to do your usual social activities, or social activities with your family?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

13. How often during the last 2 weeks have you felt as if others no longer have the same confidence in you as they did before your heart problem?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

14. How often during the last 2 weeks have you experienced chest pain while doing your day-to-day activities?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

15. How often during the last 2 weeks have you felt unsure of yourself or lacking self-confidence?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

16. How often during the last 2 weeks have you been bothered by aching or tired legs?

All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

17. During the last 2 weeks, how much have you been limited in doing sports or exercise as a result of your heart problem?
Extremely limited
Very limited
Limited quite a bit
Moderately limited
Somewhat limited
Limited a little
Not limited at all

18. How often during the last 2 weeks have you felt apprehensive or frightened?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

19. How often during the last 2 weeks have you felt dizzy or lightheaded?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

20. In general during the last 2 weeks, how Much have you been restricted or limited as a result of your heart problem?
Extremely limited
Very limited
Limited quite a bit
Moderately limited
Somewhat limited
Limited a little
Not limited at all

21. How often during the last 2 weeks have you felt unsure as to how much exercise or physical activity you should be doing?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

22. How often during the last 2 weeks have you felt as if your family is being over-Protective toward you?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

23. How often during the past 2 weeks have you felt as if you were a burden on others?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

24. How often during the past 2 weeks have you felt excluded from doing things with other people because of your heart problem?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

25. How often during the past 2 weeks have you felt unable to socialise because of your heart problem?
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time

26. In general, during the last 2 weeks how much have you been physically restricted or limited as a result of your heart problem?
Extremely limited
Very limited
Limited quite a bit
Moderately limited
Somewhat limited
Limited a little
Not limited at all

27. How often during the last 2 weeks have you felt your heart problem limited or interfered with sexual intercourse
All of the time
Most of the time
A good bit of the time
Some of the time
A little of the time
Hardly any of the time
None of the time
Not applicable

Appendix 19: Functional Limitations Profile

The following statements are about your current health and how your heart problems may have influenced your everyday life. Listen to each statement, think of yourself today and tell me if it describes you or not. If you agree or disagree you should tell me. I will then ask 'Is this due to your health' – Please answer yes or no. Ask me to repeat a statement or slow down if you do not understand. (*Read down the list of items in each category. As soon as the patient agrees with a statement you must ask whether it is due to their health, if the answer to this is yes, tick the statement and move to the next category of items*)

Ambulation (126) – The following statements describe walking and use of stairs. Please think of yourself today and tell me if you agree or disagree with the statement, and if this is due to the state of your health

1. I do not walk at all ..... (126)
2. I get about in a wheelchair ..... (121)
3. I do not use stairs at all ..... (106)
4. I only walk with help from somebody else ..... (98)
5. I get about only by using a walking frame, crutches, stick, walls, or hold onto furniture ..... (96)
6. I only go up and down stairs with assistance from somebody else ..... (87)
7. I only use stairs with a physical aid: for example, special rail, stick or crutches ..... (82)
8. I walk by myself but with some difficulty, for example, I limp, wobble, stumble or I have a stiff leg ....(71)
9. I do not walk up or down hills ..... (64)
10. I go up and down stairs more slowly, for example, one step at a time or I often have to stop ..... (62)
11. I walk shorter distances or often stop for a rest ..... (54)
12. I walk more slowly ..... (39)

Mobility (114) – These next statements describe how you get about the house and outside. Please tell me if you agree or disagree with the statement, and if it is due to the state of your health

13. I stay in bed most of the time ..... (114)
14. I stay in one room ..... (101)
15. I stay in bed ..... (91)
16. I stay at home most of the time ..... (79)
17. I only get about in one building ..... (76)
18. I only go out if there is a lavatory nearby ..... (64)
19. I do not get about in the dark or in places that are not lit unless I have someone to help ..... (57)
20. I do not use public transport now ..... (52)
21. I do not go into town ..... (47)
22. I only stay away from home for short periods ..... (46)

Recreation - The following statements describe the activities you usually do in your spare time, for relaxation, entertainment or just to pass the time. Again, think of yourself today. Please tell me if you agree or disagree with the statement, and if it is due to the state of your health.

23. I am not doing any of my usual inactive pastimes; for example, I do not watch TV, play cards,

    or read ….. (91)

24. I am not doing any of my usual physical recreation or more active pastimes ….. (81)

25. I am cutting down on some of my usual inactive pastimes; for example I watch TV less, play cards

    less, or read less ….. (50)

26. I am doing more inactive pastimes instead of my other usual activities ….. (43)

27. I am cutting down on some of my usual physical recreation or more active pastimes ….. (34)

28. I spend shorter periods of time on my hobbies and recreation ….. (32)

29. I go out less often to enjoy myself ….. (27)

30. I take part in fewer community activities ….. (25)

Social Interaction – These statements describe your contact with family and friends today. Please tell me if you agree or disagree with the statement, and if it is due to the state of you health.

64. I go out less often to visit people ….. (31)

65. I do not go out at all to visit people ….. (91)

66. I show less interest in other people's problems; for example, I don't listen when people tell me

    about their problems; I don't offer to help ….. (50)

67. I am often irritable with those around me; for example, I snap at people or criticize easily ….. (64)

68. I show less affection ….. (44)

69. I take part in fewer social activities than I used to; for example, I go to fewer parties

    or social events ….. (25)

70. I am cutting down the length of visits with friends ….. (31)

71. I avoid having visitors ….. (73)

72. My sexual activity is decreased ….. (64)

73. I often express concern over what might be happening to my health ….. (44)

74. I talk less with other people ….. (44)

75. I make many demands on other people; for example, I insist that they do things for me or tell

    them how to do things ….. (76)

76. I stay alone much of the time ….. (91)

77. I am disagreeable with my family; for example, I act spitefully or stubbornly ….. (86)

78. I frequently get angry with my family; for example, I hit them, scream or throw things at them	….. (103)
79. I isolate myself as much as I can from the rest of my family	….. (100)
80. I pay less attention to the children	….. (59)
81. I refuse contact with my family; for example, I turn away from them	….. (109)
82. I do not look after my children or family as well as I usually do	….. (66)
83. I do not joke with members of my family as much as I usually do	….. (66)

Appendix 20: Medication Adherence Report Scale

	QUESTIONS ABOUT USING YOUR MEDICINES

- Many people find a way of using their medicines which suits them
- This may differ from the instructions on the label or from what the doctor has said
- We would like to ask you a few questions about how you use your medicines

Here are some ways in which people have said that they use their medicines

For each of the statements below, please tick the box which best applies to you

	Your own way of using your medicines	Always	Often	Sometimes	Rarely	Never
M1	I forget to take them					
M2	I alter the dose					
M3	I stop taking them for a while					
M4	I decide to miss a dose					
M5	I take less than instructed					

Appendix 21: Patient Information Sheet

Study Title: The Role of Psychological Variables in Predicting Outcome Following Myocardial Infarction

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

What is the purpose of the study?

The aim of this study is to investigate some of the psychological factors which are thought to be associated with cardiac disease. With information gained from this study, we hope to have a better understanding of the factors associated with good recovery, and therefore be in a better position to plan interventions.

Why have I been chosen?

All patients who have been admitted to Edinburgh Royal Infirmary after experiencing a heart attack are being asked to participate.

Do I have to take part?

It is up to you to decide whether or not to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to with draw at any time and without giving a reason. A decision to with draw at any time, or a decision not to take part, will not affect the standard of care you receive. We will also ask for your permission to inform your GP of your participation.

What will happen to me if I take part?

If you agree to participate, I will then ask you a series of questions which should take about 30 minutes. The questions will relate to how you are feeling, what your mood is, your feelings about your illness, what beliefs you have about medicines and what you are looking forward to and are worried about. You can write the answers to any of the questions down yourself or I can write them down for you; it is entirely up to you. When I have finished asking you these questions, I will ask you whether I can contact you again in 3 months, to answer some further questions over the phone.

Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential

What will happen to the results of the research study?

The results will be analysed and published in scientific journals.

Who is organising and funding the research?

The research is organised by Department of Psychology, University of Stirling and is funded by the Chief Scientist Office in Scotland.

Contact for further information: If you require any further information about this study please contact Lynn Williams, telephone number 01786466853.

Appendix 22: Patient Consent Form

CONSENT FORM
(Version 1 16/12/2004)

Title of Project: The Role of Psychological Variables in Predicting Outcome Following Myocardial Infarction

Name of Researcher:

Please tick box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions ☐

2. I understand that my participation is voluntary and that I am free to with draw at any time, without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that sections of my medical notes may be looked at by responsible individuals from Stirling University. I give permission for these individuals to have access to my records. ☐

4. I agree to take part in the above study ☐

_____   _____   _____
Name of Volunteer   Date   Signature

_____   _____   _____
Name of Investigator   Date   Signature

Thank you for your help with this research project