Exploring the relationship between anxiety and depression in the onset and recovery of coronary heart disease: A mixed methods study

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ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

(Signature) ..........................................................
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Abstract

Depression, anxiety and coronary heart disease (CHD) are common conditions. This thesis examines the association between depression and anxiety in both the development and recovery of CHD, to inform treatment and guide optimum management of these conditions. A mixed methods approach addresses three research aims; to understand the association between depression, anxiety and incident CHD; to investigate the effectiveness of cardiac rehabilitation (CR) at reducing depression and anxiety; and to examine the role of depression and anxiety on how people make the decision to attend and complete CR. Using longitudinal data from the 45 and Up study (N=143,815), women with comorbid anxiety and depression had an increased risk of an acute coronary syndrome (HR 1.85, 95% CI 1.31-2.61) and acute myocardial infarction (HR 2.15, 95% CI 1.33-3.46). Results from a systematic review and a second study using questionnaire data found no support for CR being effective at reducing either depression or anxiety. Depression and anxiety had no impact on CR attendance or completion using the same questionnaire data. However, the results from this study were unfortunately underpowered. Key findings from qualitative data demonstrated anxiety symptoms had a role in both CR attendance and non-completion and receiving a telephone call from CR services facilitated attendance at CR. The overall conclusions drawn from this thesis support a need for future research to explore men and women’s CHD separately. To deliver effective treatments for depression and anxiety more randomised controlled trials
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recruiting cardiac patients with clinically significant levels of depression and anxiety are needed. Understanding the best time to identify patients with depression and anxiety requiring treatment should be a priority for clinical practice.
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## Abbreviations

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<th>Description</th>
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<tbody>
<tr>
<td>ACR</td>
<td>alternative cardiac rehabilitation</td>
</tr>
<tr>
<td>ACS</td>
<td>acute coronary syndrome</td>
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<td>AHA</td>
<td>American Heart Association</td>
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<td>AMI</td>
<td>acute myocardial infarction</td>
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<td>BDI</td>
<td>Becks Depression Inventory</td>
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<tr>
<td>CABG</td>
<td>coronary artery bypass graft</td>
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<td>CBT</td>
<td>cognitive behavioural therapy</td>
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<tr>
<td>CHD</td>
<td>coronary heart disease</td>
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<tr>
<td>CHF</td>
<td>coronary heart failure</td>
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<tr>
<td>CR</td>
<td>cardiac rehabilitation</td>
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<tr>
<td>CVD</td>
<td>cardiovascular disease</td>
</tr>
<tr>
<td>DSM-5</td>
<td>Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition</td>
</tr>
<tr>
<td>ENRICHD</td>
<td>Enhancing Recovery in Coronary Heart Disease Patients</td>
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<tr>
<td>GAD</td>
<td>generalised anxiety disorder</td>
</tr>
<tr>
<td>HADS</td>
<td>Hospital Anxiety and Depression Scale</td>
</tr>
<tr>
<td>HRT</td>
<td>hormone replacement therapy</td>
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<tr>
<td>IPQ-R</td>
<td>Illness Perception Questionnaire - Revised</td>
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MDD     major depressive disorder
Non-RCT  non-randomised control trial
PCI      percutaneous coronary intervention
PTCA     percutaneous transluminal coronary angioplasty
PTG      post-traumatic growth
RCT      randomised control trial
CS-SRM  common-sense self-regulation model
TPB      Theory of Planned Behaviour
SADHART  Sertraline Antidepressant Heart Attack Randomised Trial
SCR      standard cardiac rehabilitation
SSRIs    selective serotonin reuptake inhibitors
UC       usual care
Coronary Heart Disease (CHD) burden

When it comes to considering the societal cost of disease represented by disability-adjusted life years (DALY), both depression and heart disease are leading disorders. The World Health Organization (WHO) has projected that CHD and depression will be ranked second and third worldwide respectively on the list of diseases responsible for the greatest increase in DALY by 2030 (Mathers & Loncar, 2006). Currently, CHD is the leading cause of death in Australia, accounting for 16% of all deaths (Australian Bureau of Statistics (ABS), 2009). CHD places a considerable burden on the Australian population, both in terms of costs and disability, being responsible for the greatest health system expenditure (Australian Institute of Health & Welfare, 2005).

The major risk factors for CHD are well established and include hypertension, diabetes, hyperlipidaemia, with additional behavioural risk factors such as tobacco use, unhealthy body mass index (BMI), physical inactivity and excessive use of alcohol (WHO, 2015). In recent decades risks from psychosocial factors have been implicated. A particular focus of this research is on the association between depression and CHD, establishing a link between depression and the onset of CHD, the recurrence of cardiac events (Vogelzangs et al., 2010) as well as poorer outcomes such as higher morbidity and mortality, poor symptom relief and poorer health beliefs (Doering et al., 2011). To a lesser extent, and with more inconsistent findings, anxiety is also associated with both the onset and the progression of heart disease (Frasure-Smith & Lespérance, 2008; Janszky,
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Ahnve, Lundberg, & Hemmingsson, 2010; Roest et al., 2013). The aim of this thesis is to focus on this relationship between depression and anxiety, and CHD.

The contribution of depression and anxiety to CHD burden

The importance of the role of psychosocial variables has gathered momentum over the last few decades since Type A behaviour was identified by researchers as a risk for CHD (Friedman & Rosenman, 1959). When studies failed to find a robust association between Type A and CHD, researchers turned to explore the risk of other psychological variables such as anger, hostility (Smith, 1992), and more recently depression and anxiety (Frasure-Smith, Lespérance, & Talajic, 1995; Kubzansky, Kawachi, Weiss, & Sparrow, 1998). Depression has received by far the most attention in past research of all the psychosocial variables, with compelling evidence supporting its role in CHD. The evidence on anxiety is less plentiful, but as depression and anxiety are often comorbid (Kessler, DuPont, Berglund, & Wittchen, 1999) it is important to consider their combined effect as well as their independent effects. Cardiac patients experience a higher level of depression than the general population, reportedly three times higher (Lichtman et al., 2008) with previous studies reporting the prevalence of depression amongst patients after experiencing a cardiac event to range between 15 and 20% (Bunker et al., 2003; Glassman & Shapiro, 1998; Grace et al., 2009; Lespérance & Frasure-Smith, 2000). This evidence demonstrates the importance of gaining a better understanding of the mechanisms of the relationships between depression, anxiety, and CHD.

CVD/CHD: an explanation of the terms to be used. It may be useful to explain what terms will be used throughout this thesis when referring to heart disease. As
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mentioned earlier in this chapter, CHD is the leading cause of death globally. CHD falls under the collective term of cardiovascular disease (CVD). The main types of CVD, other than CHD, are stroke, heart failure, peripheral vascular disease, and congenital heart disease (Department of Health, 2015). CVD is the name given to all diseases that are conditions of the blood and heart vessels. The main cause of most CVDs is a process known as atherosclerosis, the build-up of fatty plaque in the walls of the arteries supplying blood to the heart muscle over a long period of time. The fatty plaque narrows the arteries and reduces the flow of blood to the tissues distal to the plaque. The process of atherosclerosis makes CVD responsible for 17.4 million deaths and accounts for 31% of all deaths globally (World Health Organisation, 2015).

CHD can also be referred to as coronary artery disease (CAD), or ischemic heart disease (IHD). CHD is the collective name for stable angina, unstable angina, myocardial infarction (MI) and sudden coronary death. Acute coronary syndrome (ACS) refers to acute myocardial infarction (AMI) and unstable angina. Although the cause is the same for all CVDs, treatment and approaches to recovery differ, therefore the primary focus of this thesis is on CHD, but CVD is referred to when it is relevant.

The contributions of depression and anxiety to increased CHD incidence. The independent link between major depressive disorder (MDD) and mortality in AMI patients was first demonstrated in 1993 (Frasure-Smith, Lespérance, & Talajic, 1993). Since this study, further studies have examined the association of MDD, generalised anxiety disorder (GAD), and elevated depression and anxiety symptoms on both mortality and morbidity in patients with CHD and in healthy populations without any pre-existing CHD (Jansky et al., 2010; Frasure-Smith et al., 1993).
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The evidence from prospective observational studies examining healthy populations found depression to be associated with an increased risk of CHD (Ariyo et al., 2000; Barefoot & Schroll, 1996; Ford, Mead & Chang, 1998; Frasure-Smith et al., 1993). Over the last decade five meta-analyses and systematic reviews have found depression to be a risk for CVDs and CHD (Bunker et al., 2003; Lett et al., 2004; Nicholson, Kuper, & Hemingway, 2006; Van Der Kooy, Hout, Marwijk, Marten, & Stehouwer, 2007; Wulsin & Singal, 2003). These meta-analyses examining the role of depression in the onset of CHD/CVD found an association existed. These reviews demonstrated that heart disease patients with depression had a relative risk of between 1.8 to 2.6 of another cardiac event or mortality (Barth, Schumacher, & Herrmann-Lingen, 2004; Nicholson et al., 2006; van Melle et al., 2004). In the general population, depression was found to increase the rate of CHD, with pooled relative risks between 1.6 and 1.8 (Nicholson et al., 2006; Rugulies, 2002; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). However, there was variation among studies included in these reviews in terms of how depression was identified, the severity of depression and the number of covariates adjusted for in each study (Nicholson et al., 2006; Rugulies, 2002; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). Only two of the meta-analyses reported on heterogeneity, and both studies found this to be substantial. Based on these issues Nicholson et al., (2006) concluded in their review there was not yet enough evidence to establish depression as a risk factor for the onset of depression in healthy populations.

The risk of CHD associated with anxiety has not had as much attention as depression, and there has been far less consistency in the results. Evidence from a couple of large-scale studies found anxiety to be associated with CVD (Fan, Strine, Jiles, &
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Mokdad, 2008) and CHD (Janszky et al., 2010). One study included a sample of 129,499 participants and found participants with a lifetime history of anxiety had a significantly higher risk of CVD, including angina and CHD (Fan et al., 2008). Another large population-based study of 49,321 men with a long follow-up period of 37 years, measuring both diagnosed anxiety and depression, found anxiety but not depression to be a risk for the onset of CHD (Janszky et al., 2010). A recent meta-analysis, published in the same year and therefore did not include data from Janszky et al., (2010), also concluded anxiety to be a risk for CHD and cardiac death (Roest, Martens, de Jonge, & Denollet, 2010). A strength of this review was 18 of the 20 studies included had adjusted for a number of demographic characteristics, health behaviours and established biological risk factors. However, heterogeneity was substantial due to differences between included studies on measures used for anxiety, the duration of follow-up, and the age and sex composition of the samples, which casts doubt on the strength of the association of anxiety as a risk for the onset of CHD. The risks of incident CHD associated with depression and anxiety and issues of heterogeneity are discussed in greater detail in Chapter 2. In summary, there is evidence to suggest that both anxiety and depression are risks for the onset of CHD. However, there are inconsistencies in the evidence.

Although many studies have examined both depression and anxiety, the effects of having comorbid anxiety and depression are largely overlooked. Anxiety and depression are often comorbid (Kessler et al., 1999; Suls & Bunde, 2005). They also share similar treatment approaches (Nathan & Gorman, 2002). Few studies have investigated the combined interactive contribution of anxiety and depression in predicting CHD events. Although symptoms of anxiety and depression co-occur in patients with CHD, little is
known about their combined effects on CHD risk. A few prospective studies to date have investigated the independent versus the interactive effects of anxiety and depression. Only one study appears to have examined the effects of comorbid anxiety and depression on the onset of incident CHD in a healthy population at baseline (Berecki-Gisolf, McKenzie, Dobson, McFarlane, & McLaughlin, 2013). Berecki-Gisolf and colleagues (2013) using a large sample of women, found comorbid anxiety and depression increased the risk for the onset of CHD. It is not clear from the current evidence whether this risk extends to men. Although previous studies exist examining the possible risk of depression and the onset of incident CHD in healthy populations and to a lesser extent anxiety, there are inconsistencies in the evidence that would be worthy of future investigations.

**Depression and anxiety definitions and measures.** Over the last few decades evidence linking depression and anxiety to heart disease have been based on a wide range of ways of operationalising and measuring these constructs, including measuring the presence of clinical diagnoses and severity of symptoms using both diagnostic interviews and self-report measures. Some studies used self-report measures to identify clinically significant psychological distress whereas others used diagnostic interviews to determine whether cardiac patients meet criteria for specific psychological disorders as defined in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013). In this manual MDD is defined as being present when over a period of at least two weeks, for the majority of the time, a person has experienced at least five of the following symptoms. To meet criteria for minor depressive disorder
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two symptoms are required to be experienced over this time period. The symptoms are as follows;

- “depressed mood or irritable most of the day, nearly every day, characterized by sadness, emptiness, or hopelessness
- Decreased interest or pleasure in most activities, most of each day
- Significant weight change (5%) or change in appetite
- Change in sleep: insomnia or hypersomnia
- Change in activity: Psychomotor agitation or retardation
- Fatigue or loss of energy
- Guilt/worthlessness: Feelings of worthlessness or excessive or inappropriate guilt
- Concentration: diminished ability to think or concentrate
- Suicidality: thoughts of death or suicide”

(DSM-5; American Psychiatric Association, 2013 p. 405)

It is noteworthy in some studies the two-week criterion for experiencing symptoms was reduced to a shorter timeframe to identify MDD in recently hospitalised cardiac patients which raised the issues of the stability of the diagnosis (Davidson et al., 2006; Freedland et al., 2002).

There are a number of anxiety disorders classified in the DSM-5. The most common anxiety disorders to be studied in cardiac populations is generalised anxiety disorder (GAD), followed by posttraumatic stress (PTSD) and panic disorder (PD). Some degree of anxiety is normal, especially after having a cardiac event (Moser & Dracup, 1996). Everyone has worries and fears in given situations (Gullone, 2000). In fact, the
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body’s response to fear, as described by Cannon (as cited in, Morrison, Bennett, Butow, Mullan, & White, 2012, p.376), the fight or flight response, can be lifesaving. Anxiety becomes a problem when it interferes with a person’s ability to cope with everyday situations. Recent recommendations from the American Heart Association (AHA) suggest assessing the effects of anxiety in the prognosis of heart disease in future studies (Lichtman et al., 2014). The current evidence on anxiety and it’s association with CHD has not always been clearly defined, which has possibly hindered the understanding of the effects of anxiety (Tully, Cosh, & Baumeister, 2014).

GAD is when an individual experiences excessive anxiety and worry which makes it difficult to manage everyday activities or participate in events. As GAD is the most common anxiety disorder observed in a cardiac population, the criteria for this disorder will be presented. For a person to meet the criteria for GAD, three of the following symptoms need to be experienced for most days for the past six months;

- “restlessness or feeling on edge
- Being easily fatigued
- Difficulty concentrating or mind going blank
- Irritability
- Muscle tension
- Sleep disturbance (difficulty falling or staying asleep, or restless unsatisfying sleep)”

(DSM-5; American Psychiatric Association, 2013, p.222)
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Anxiety symptoms often overlap with other symptoms, and this can result in a diagnosis of more than just one disorder for some people (Kolzet & Inra, 2005). This overlap in symptoms creates challenges for both the clinician and also for the researcher.

Anxiety and depression can be comorbid in both the general population and this is also true for cardiac patients. In cardiac patients over half of MDD cases are comorbid with GAD (Sherbourne et al., 1996). It is suggested that anxiety and depression are characteristics of a broader negative affect dimension (Suls & Bunde, 2005; Bleil et al., 2008). It is argued they cause the same biological dysfunction or that they may originate from parallel genetic dispositions (Hettema, 2008; Flory, Manuck, Matthews, Muldoon, 2004). The criteria for diagnosing both depression and anxiety include symptoms that overlap (e.g. fatigue, restlessness/agitation, concentration and sleep difficulties) (American Psychiatric Association, 2000) which may partially explain the comorbidity.

In the evidence evaluating the role of depression and anxiety in CHD, detecting the presence of these disorders has been carried out using both scales and/or structured clinical interviews. The most commonly used self-report questionnaires to assess depression and anxiety symptoms in cardiac patients are the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983), Beck Depression Inventory (BDI) (Beck, Steer, & Carbin, 1988), the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977), the Patient Health Questionnaire-2 (PHQ-2) (Kroenke, Spitzer, & Williams, 2003) and the Stait-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The sensitivity and specificity of these scales have been found to be acceptable for screening and epidemiological purposes (Davidson et al.,
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2006). For a formal clinical diagnosis of depression or anxiety, a structured interview is required.

Commonly used structured interviews used for assessing a clinical diagnosis of depression and anxiety in cardiac patients are the Depressive Interview and Structured Hamilton Interview Depression (ENRICHD, 2000), the Structured Clinical Interview for DSM-IV Axis I Disorders (First, Gibbon, Spitzer, Williams, & Benjamin, 1997) and the Diagnostic Interview Schedule (Robins, Helzer, Croughan, & Ratcliff, 1981). In a cardiac population, the initial screening for depression and anxiety symptoms is completed using self-report questionnaires, and a structured interview.

The role of depression and anxiety following a cardiac event

After having a cardiac event both depression and anxiety can have an impact on the morbidity and mortality of a patient (Carney et al., 2009; Martens et al., 2010). Previous research has shown 15-30% of cardiac patients experience anxiety or depression, but although symptoms of both are raised while still in hospital, the level of symptoms have been shown to rise several weeks later and stay elevated for at least a year (Johnston, Foulkes, Johnston, Pollard, & Gudmundsdottir, 1999). It is not clear whether the timing of the onset of depression leads to worse prognosis after an AMI. One study found a worse prognosis was associated with depression only when patients developed it after an AMI, but in patients with pre-existing episodes of depression before their cardiac event, there was no association found (de Jonge, van den Brink, Spijkerman, & Ormel, 2006). Further research is needed to understand how the timing of the development of depression and whether the duration of depression impact on patient outcomes and if so what is the extent of this relationship.
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Similar to depression, studies have also found anxiety to be related to increased CHD morbidity and mortality (Frasure-Smith & Lespérance, 2008). Some studies have reported an association between anxiety and an increased risk of mortality after a cardiac event (Roest, Martens, Denollet, & de Jonge, 2010; Strik, Denollet, Lousberg, & Honig, 2003; Tully, Baker, Turnbull, & Winefield, 2008). Cardiac patients with elevated levels of anxiety were found to have a 2-fold increased risk of mortality. This risk was 3-fold when anxiety was comorbid with depression (Watkins et al., 2013). However, there are studies on anxiety that report it is not associated with poor clinical outcomes (Kornerup, Zwisler, & Prescott, 2011; Lane, Carroll, Ring, Beevers, & Lip, 2001). To reduce the risk of poorer outcomes for patients, a greater understanding of the role of depression and anxiety in CHD recovery is required. At present, it is unclear from the available evidence what the mechanisms are between depression, anxiety, and CHD.

Possible mechanisms that associate anxiety and depression with the onset of heart disease. The advances in heart disease treatments and cardiac patients’ rehabilitation care have been dramatic over the past two decades. With the advancement of medical knowledge, patients no longer receive a prescription for bed rest after experiencing an AMI, in contrast, the advice for recovery now is to be active. With the advent of angioplasty and coronary artery stents, patients have a quicker relief from their symptoms and pain enabling them to get back to their normal life. Despite these advancements in the treatment of heart disease, this has not decreased the number of recurrent events seen overall in people with ACS (Franco, Cooper, Bilal, & Fuster, 2011; Roger et al., 2012). From the current evidence, it is unclear what would be an effective psychological treatment for cardiac patients. Long-term adherence to healthy behaviours
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is a great concern for healthy ageing. The possibilities of modifying existing approaches and creating more effective treatment programs for cardiac patients with anxiety and depression is still required to reduce the number of recurrent events and improve patients’ psychological recovery.

Atherosclerosis as the cause of CHD is widely accepted. Atherosclerosis is a progressive disease that may start in childhood and adolescence (McGill et al., 2000). The cause of atherosclerosis can be the result of a combination of factors, associated with a person’s behaviour, genes, and the environment. Up to 80% of middle-aged individuals in the developed world will have some evidence of CHD (Roger et al., 2011). Not all of these people will go on to experience an ACS. In the USA no more than 1% of the population over the age of 40 will have an ACS in any year (Roger et al., 2011). Although the cause is known, the mechanisms that make some people more susceptible are not entirely understood.

Both biological and behavioural hypotheses have been offered to explain the possible mechanism for associated risk between depression and anxiety and the onset of CHD. The relationship between depression and anxiety, and CHD are very complex and bidirectional (Lippi, Montagnana, Favaloro, & Franchini, 2009). Numerous biological mechanisms have been offered to explain the link between depression and CHD. These explanations include abnormal platelet function (Cameron et al., 1990), neuroendocrine dysfunction and disturbances in autonomic cardiac control (Carney et al., 2001; de Jonge et al., 2006), inflammatory markers such as C-reactive proteins (Howren, Lamkin, & Suls, 2009) and activation of the hypothalamic-pituitary-adrenocortical axis (Musselman, Evans, & Nemeroff, 1998). The potential mechanisms through which anxiety may be a
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risk factor are possibly through atherosclerosis, decreased heart variability and a risk of ventricular arrhythmias (Watkins et al., 2010). Understanding these mechanism remains an ongoing research issue and identifying what the possible physiological mechanisms are that link depression and anxiety to CHD.

The role of behavioural risk factors is equally unclear. Both depression and anxiety are related to treatment adherence (Carney, Freedland, Eisen, Rich, & Jaffe, 1995) as well as modifiable risk factors that are already known to increase patients risk of CHD, such as unhealthy lifestyles (Bonnet et al., 2005), in particular, poor diet, smoking, excessive alcohol and physical inactivity (Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991). The extent to which psychological distress is associated with the onset of CHD is widely explained by increasing behavioural risks such as smoking, drinking too much and not getting enough physical activity (Hamer, Molloy, & Stamatakis, 2008). This evidence exploring the mechanisms linking behaviour to CHD suggests interventions that can reduce psychological distress and increase positive behavioural change could help to decrease morbidity and mortality attributable to anxiety and depression.

Given that both depression and anxiety are treatable conditions, it is important to consider the potential benefits of identifying and treating those patients that present with such disorders during their recovery from a cardiac event. Amongst individuals free of chronic disease, depression, and anxiety can be treated effectively with either pharmacological interventions, non-pharmacological treatments or a combination of both (Parikh et al., 2009). For cardiac patients with either depression or anxiety, it is unclear from the current evidence what the most effective way to treat these conditions and improve symptoms is, and whether such treatments could act to reduce the risk of
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recurrent cardiac events. RCTs examining interventions to treat depression and anxiety have revealed mixed results (Kop & Gottdiener, 2012). The most common treatment for depression and anxiety in cardiac patients is pharmacotherapy (Kop & Gottdiener, 2012). However, after having a cardiac event, cardiac patients are commonly offered the opportunity to address behavioural risk factors, such as diet and physical activity to improve and reduce the risk of morbidity and mortality as part of CR (Dunn et al., 2009). If these treatment programs broadened their scope to address the behavioural risk factors associated with depression and anxiety, there is potential to reduce the burden associated with CHD.

CR – the cornerstone of recovery

CR is the gold standard approach used by health services to improve the outcomes of patients who have recently had a cardiac event, and they are routinely offered as part of treatment to enhance recovery from a cardiac event (National Institute for Health and Care Excellence, 2007). CR is an evidence-based intervention that aims to reduce future risks to morbidity and mortality through improving patients’ physical, psychological and emotional well-being (Dalal, Evans, & Campbell, 2004). CR programs are proven to be effective at reducing morbidity and mortality (Connor et al., 1989; Jolliffe et al., 2001; Rutledge, Redwine, Linke, & Mills, 2013; Taylor et al., 2004). These secondary prevention programs are provided by health professionals in either an acute or community-care settings to target risk factors through exercise, education, counselling and behavioural change (Taylor, Dalal, Jolly, Moxham, & Zawada, 2010).

The benefits of attending CR. CR aims to reduce the risk of recurrent events by improving patients’ physical, psychological and emotional recovery (Dalal, Evans, &
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Campbell, 2004). Empirical research exists to support both the physiological and psychological benefits of attending a CR program to varying degrees. The physiological benefits derived from CR attendance are improvements in exercise capacity and reduction of risk factors (e.g. stop smoking, lower lipids levels, body weight, blood pressure, blood glucose, possibly reducing the effects of atherosclerosis). The psychological benefits of attending CR include improving quality of life (Yohannes, Doherty, Bundy, & Yalfani, 2010). There is some evidence to support CR being effective at reducing depression and anxiety symptoms (Yohannes, Doherty, Bundy, & Yalfani, 2010), although the evidence explicitly addressing this question is limited and only a few studies have examined the effectiveness of CR to reduce depression and anxiety in cardiac patients with clinically significant depression and anxiety (Bettencourt et al., 2005; Hevey et al., 2007; Lacey et al., 2004). One of the research aims of this thesis is to investigate the effectiveness of CR to reduce depression and anxiety.

CR is a proven program in terms of cardiac outcomes, with evidence to support a significant reduction in recurrent cardiac events among those patients who complete CR (Rutledge et al., 2013). Given that there is evidence to support both the physiological and psychological benefits of attending a CR program, these being to improve quality of life and reduce the risks of morbidity and mortality after a cardiac event, the uptake of CR among those for whom it is indicated is surprisingly low (Beswick et al., 2005). Although there are proven benefits to attending CR, it is not clear whether this is the most effective intervention for reducing depression in cardiac patients.

**How effective is CR at reducing depression and anxiety in cardiac patients?**

As depression and anxiety are risk factors for worse cardiac outcomes, it is important to
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understand whether CR is effective at reducing levels of both, in patients. Two reviews have examined the effectiveness of CR interventions at reducing depression. One review only examined studies where participants were over the aged of 65 (Gellis & Kang-Yi, 2012), and concluded that community-based CR programs had a positive impact on reducing depression, and the greatest effect reported was in home-based programs. The other review examined a wide range of interventions including alternative mental health interventions and used a very broad definition for CR which included programs that were developed specifically for research purposes as well as community hospital run programs that were available to all participants (Rutledge et al., 2013). CR was reported to have a small to moderate effect on reducing depression in CHD patients, with both mental health interventions and CR found to reduce recurrent events, but only CR was effective at reducing total mortality. This finding suggests that CR may not be the most effective intervention for treating depression, but the benefits to cardiac outcomes are important. To be able to inform clinical practice of the most effective way to treat patients with anxiety and depression, it is useful to assess whether current CR services can address the psychological needs of those with anxiety and depression. There currently appears to be only reviews evaluating the effectiveness of CR interventions at reducing and treating depression; there seems to be none that extends to the effectiveness of reducing anxiety. Chapter 3 reviews the quality of the current evidence on how effective CR is at reducing depression and extends this to include anxiety.

There is an underrepresentation of clinical trials examining interventions to treat depression in cardiac patients and even less on reducing anxiety. An intervention investigating pharmacological interventions in cardiac patients with MDD examined
selective serotonin reuptake inhibitors (SSRIs) in a double-blind RCT comparing SSRIs with a placebo (Glassman et al., 2002). This RCT the Sertraline Antidepressant Heart Attack Randomised Trial (SADHART) found that patients with severe and recurrent depression had significant improvements in depression scores compared to the placebo group. A similar conclusion supported the use of citalopram. An RCT (CREATE) reported a reduction in depression in the group taking citalopram (Lespérance et al., 2007). The largest behavioural trial to date, the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD) examined CHD patients receiving cognitive behavioural therapy (CBT) compared to a control group (Berkman et al., 2003). Both the intervention and the control group could take antidepressant medication if depression persisted. A significant reduction in depression symptoms was observed in both groups at six months follow-up. A post hoc analysis which examined anti-depressant use in both the intervention and control group reported a significant reduction in adverse cardiac outcomes (Berkman et al., 2003). However, anti-depressant medication was not found to work for all cardiac patients and alternative ways to treat depression need to be identified with more rigorously designed RCTs.

Exercise is an intervention found to reduce psychological distress when compared to patients receiving usual care (Blumenthal et al., 2005). However, only a modest reduction in depression was reported. Other psychological interventions used in cardiac patients to reduce depression have included CBT, interpersonal therapy, stress management and social support groups. Meta-analyses reviewing the efficacy of psychological interventions concluded they appear to be effective at reducing depression and anxiety, reporting a small effect in reducing cardiac mortality (Whalley, Thompson,
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& Taylor, 2014). However, the authors concluded many of the findings included populations that did not report on clinically significant levels of either depression or anxiety, so it remains unclear which subgroups of cardiac patient benefits most from these psychological interventions.

As depression and anxiety are common in patients with CHD, an aim of current research and clinical practice is to find successful interventions to reduce not just the symptoms and improve quality of life, but also to reduce the risks of adverse outcomes associated with psychological distress. It is not understood what the mechanisms are between depression and anxiety in relation to adverse cardiac outcomes. Neither is it clear from the current evidence the effectiveness of CR to reduce depression and anxiety in patients with clinically significant depression and anxiety. It may be possible that a combination of approaches may be the most effective treatment as there may not be a single approach to treating depression and anxiety that will work for all cardiac patients.

**Barriers to uptake and adherence to CR programs.** Researchers have found barriers to explain non-attendance at CR. These include unhelpful illness perceptions (French, Cooper, & Weinman, 2006), transport difficulties, sociodemographic characteristics (Mochari, Lee, Kligfield, & Mosca, 2006), physician endorsement (Fernandez, Davidson, & Griffiths, 2008), CR beliefs (Cooper, Weinman, Hankins, Jackson, & Horne, 2007), poor knowledge of risk factors, depression and anxiety (McGrady, McGinnis, Badenhop, Bentle, & Rajput, 2009).

Initially, the focus for barriers to CR examined sociodemographic variables, which are often unmodifiable (Daly et al., 2002). In more recent years there has been an increase in research generated examining psychosocial factors that can act as barriers to
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the uptake of CR (Cooper et al., 2007; French et al., 2006; Grace et al., 2005). The research focus for these barriers examined samples of predominantly white middle-class men, with fewer studies examining groups who are least likely to attend; such as women, older people, people who are socially deprived or members of ethnic minorities (Beswick et al., 2006; Johnson et al., 2003; Thompson et al., 1997).

The evidence already presented illustrates the important role CR plays in a patient’s recovery from a cardiac event, but psychological factors interfere with both uptake and adherence to these programs. It is important to understand the relationships these psychological factors play on how people make their decision to either attend or not attend CR. A deeper understanding of these factors and how they may be modified can inform the development of interventions to both increase uptake and patient adherence to programs. Evidence suggests that psychological factors appear to affect both uptake and adherence to CR (Casey, Hughes, Waechter, Josephson, & Rosneck, 2008).

McGrady et al. (2009) found that patients with high anxiety and depression were less likely to complete a CR program. This finding has been supported by other evidence in which patients with more depressive symptoms and higher depression scores were less likely to participate in CR. They were also less likely to complete the sessions if they did attend, compared to those with low depression (Glazer et al., 2002; Grace et al., 2005; Sanderson & Bittner, 2005; Yohannes et al., 2007). However, these findings are not consistent with the evidence from other studies supporting depression as a predictor of attendance at CR (Glazer, Emery, Frid, & Banyasz, 2002; Whitmarsh, Koutantji, & Sidell, 2003). Further exploration of what the role of depression is for attendance and completion may help understand why patients may not attend or complete CR.
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Patients with coronary artery bypass graft (CABG) reported lower anxiety and depression scores and were more likely to complete a CR program than patients with MI, angina or coronary heart failure (CHF) (McGrady et al., 2009). McGrady et al., (2009), attributed this to patients with CABG having quicker relief from their symptoms and believing that the surgical procedure had completely resolved the problem. Unfortunately, this study did not assess patient’s beliefs about treatment. These beliefs could be important, as beliefs may be a powerful factor in decreasing anxiety in patients who have undergone CABG and other cardiovascular procedures (McGrady et al., 2009). McGrady et al., (2009) proposed that health professionals need to identify patients with depression and anxiety to help increase participation rates at CR. Doering, McKinley & Riegel (2011) examined depression and health beliefs in women after a cardiac event. They found depressed women were 50% more likely to be anxious and 30% more likely to experience a sense of low control over their health status than non-depressed women. As these women believe they cannot control or influence the course of their heart disease, this could affect their decision to attend CR. To gain a clearer understanding of how depression and anxiety affect attendance and completion of CR, it is beneficial to assess the impact depression and anxiety have on patients’ health perceptions and how this may affect attendance and adherence to CR.

Theoretical models in CHD. Psychological research into predicting attendance and adherence to recovery from a heart attack has mainly been led by the Common-Sense Self-Regulation Model (CS-SRM) (Leventhal, Meyer, & Nerenz, 1980) and the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The TPB proposes the importance of a person’s intention to perform a behaviour. They deemed three factors influence the
intention to perform a given behaviour; the person’s attitude towards performing the behaviour; the subjective norms and finally the perceived behavioural control. In previous studies using the TPB to look at adherence to exercise training in CR programs, intentions to exercise predicted exercise adherence (Blanchard, Courneya, Rodgers, & Murnaghan, 2002). A study with a one-year follow-up examining the variables exercise, smoking cessation and distance walked in CHD patients, found that perceived control predicted these behaviours, but intentions was not a reliable predictor. The authors concluded that behaviour change needs to address issues of action rather than motivation alone (Johnston, Johnston, Pollard, Kinmonth, & Mant, 2004). Criticisms of the TPB have been that the intention to perform a behaviour is not always successful at predicting the actual performance of the behaviour, explaining only a single response to an illness and neglecting the emotional response that comes with how people make sense of their illness (Sharpe & Curran, 2006).

When examining the illness perceptions of people with CHD the CS-SRM has been useful in explaining and predicting the behaviour of cardiac patients by understanding how people respond to a perceived illness threat. The model sets out to explain how people when faced with an illness such as CHD, make sense of their illness by developing both an emotional and commonsensical cognitive representations (see Figure 1). According to the model, illness perceptions comprise of five components which are beliefs about: identity, the label given to the disease; cause, in the case of CHD that could be stress, diet, lack of exercise; consequences, the physical, economic and social implications; cure or control; and timeline, how long they perceived their illness continuing (Brownlee et al., 2000). These cognitive representations have been used in
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previous research into the uptake of CR, to determine how people deal with the threat to their health and the coping responses they use to either modify or deal with the threat. A recent meta-analysis of CR attendance found that four of the five illness perceptions were predictive of CR attendance, with only the timeline not being predictive (French et al., 2006). The CS-SRM allows for illness representations to take into account other factors such as social roles and self-identity. For people to be able to construct an illness representation they use knowledge and experience and for adjustment to illness the individual needs to regulate a self-identity (Brownlee et al., 2000). Unlike the TPB, the CS-SRM allows for the relationship between emotional outcome and illness representation.

Figure 1. The commonsense self-regulation model of illness. From “Illness cognition: using common sense to understand treatment adherence and affect cognition interactions”
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The CS-SRM has been used to explain how cardiac patients adapt to illness. The model identifies dimensions involved in how a patient processes the information about their illness and how this view then guides their coping behaviours and subsequent outcomes. A further sixth dimension was added at a later date after subsequent research found illness coherence (how a person makes sense of their illness) was observed to be relevant to coping with the threat of illness (Moss-Morris et al., 2002).

**Illness perceptions.** Evidence supports illness perceptions as being predictors of CR uptake (French et al., 2006). Patients who believed they can control their condition are more likely to attend CR. If a patient’s illness perceptions can be improved during a hospital stay and before commencing CR, this may increase attendance rates. Negative illness perceptions are associated with a higher rate of rehospitalisation and increased mortality a year later (Cooper, Lloyd, Weinman, & Jackson, 1999; Whitmarsh et al., 2003). A meta-analysis that included eight studies conducted by French, Cooper & Weinman (2006) concluded that illness perceptions predicted attendance at CR, with the strongest predictor of attendance being a person’s belief that they could control/cure their condition, but this only explained 5% of the overall variance. Other variables that were found to have a smaller yet significant effect included perceiving their heart disease as being symptomatic, having severe consequences and understanding their condition (French et al., 2006). The findings from this meta-analysis concluded that on their own illness perceptions do not predict CR attendance, but they may have an effect when combined with other factors.
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However, contrary to these findings an intervention to change patients’ illness perceptions while in hospital found that health beliefs did not predict attendance at CR, but did predict health-related quality of life (French, Lewin, Watson & Thompson 2005). This finding could indicate that illness perceptions change over time (Sheldrick et al., 2006) and collecting patient’s illness perceptions 24 hours after a cardiac event may give different results than collecting them on discharge.

Previous research has shown that patient beliefs and understanding of their illness are related to attendance at CR (Horne, Weinman, & Hankins, 1999). Petrie et al., (1996) used the Self-Regulatory Model (Leventhal & Diefenback, 1992) to understand how having a strong belief that their illness is controllable could predict attendance at CR. This finding was also supported by Cooper, Jackson & Weinman (2002). Both studies used the Self-Regulatory Model (Leventhal & Diefenback, 1992) to explore patient’s illness perceptions to modify their beliefs about illness and improve CR attendance. Findings from these studies showed a significant difference between the illness perceptions of those who dropped out of CR and those who adhered to the program, with the drop out group reporting a greater number of physical symptoms. Those who attributed their illness to their lifestyle had higher rates of CR attendance (Cooper et al., 2002). Yohannes, Yalfani & Doherty (2007) found few previous studies had used the revised Illness Perception Questionnaire (IPQ-R) (Moss-Morris et al., 2002) with respect to attendance at CR. Over a fifth of participants in their study did not complete CR. Predictors of early drop out included being younger, female, and having higher levels of psychological distress. Illness perceptions found to be predictive of low attendance were
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having fewer illness consequences, and perceiving more personal and treatment control over their CHD (Yohannes, Yalfani, Doherty, & Bundy, 2007).

Factors other than illness perceptions may impact on patients’ decisions to attend CR. Very few studies to date have explored the importance of treatment beliefs. Cooper, et al., (2005) discovered that some patients viewed attendance at CR as inappropriate and unnecessary. These patients did not understand the role and the importance of physical activity as part of their recovery and did not understand what CR involved. If people attribute the cause of their CHD to stress, then they will have difficulty understanding and making sense of a CR program looking to change their eating habits and increase physical activity if they do not understand the process of atherosclerosis. Targeting interventions at changing patient beliefs about CR may be an effective way to increase CR uptake. Illness perceptions and beliefs about CR, like depression and anxiety symptoms are associated with worse outcomes in cardiac patients. Previous studies have demonstrated the way patients make sense of their illness has been shown to have a significant influence on their recovery (French et al., 2006). These psychological factors have all been found to have an effect on CR completion and attendance. Understanding the relationship between these variables and ways to modify the negative effects they have on cardiac patients might increase uptake and completion of CR.

Conclusion and gaps in knowledge

Depression and anxiety in healthy populations have both been associated with an increased risk of incident CHD (Nicholson et al., 2006; Roest, Martens, de Jonge et al., 2010). However, this evidence suffered from substantial heterogeneity. The inconsistencies in the literature may exist due to the different classifications of heart
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disease, and the various measures used for depression. It appears that only one previous
study has examined the risk of comorbid depression and anxiety in a healthy population
of women on incident CHD (Berecki-Gisolf et al., 2013). No previous studies appear to
have investigated whether this risk extends to men. There are inconsistencies in the
current evidence, therefore, by using a large cohort study, it is hoped these issues can be
addressed.

The issues surrounding CR participation are complex and cannot be
underestimated, due to the important benefits to be gained by attending CR. These
benefits include improving cardiac outcomes by reducing morbidity and mortality. For
this to take place, patients need to understand CR is part of their recovery from a cardiac
event. The patient needs to be willing and able to attend and actively participate in the
sessions. Only then will this form of secondary prevention therapy be beneficial for the
long term. More research is needed to help fill the gaps in both practice and knowledge
for effective secondary prevention programs (Sanderson et al., 2010). Despite the
effectiveness of CR at improving morbidity and reducing mortality in cardiac patients,
uptake of these community-based services are underutilised. It is unclear and an aim of
this thesis to understand how effective CR is at reducing depression and anxiety.
Evidence exists reporting on CR uptake and adherence. The numbers of patients
attending CR are far from optimal, with rates of attendance being reported to be between
15 to 35% of eligible patients, meaning many people are not receiving the benefits from
these programs, (Centers for Disease Control and Prevention, 2008; Sundararajan et al.,
2004). There are inconsistent findings on how the role of depression and anxiety affect
the decision to attend CR. Few studies to date have explored how the role of depression
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and anxiety may impact how cardiac patients make the decision to attend CR. It is not clear what the impact of depression and anxiety are on patients illness perceptions which have been found to predict attendance (French et al., 2006). Patients’ beliefs about CR have been found to be a predictor for attendance, yet it is not clear whether depression and anxiety have an effect on patient’s cardiac rehabilitation beliefs. This thesis aims to examine these gaps in the literature. One of the Australian Governments’ National Research Priorities is to examine an ageing population to promote good health and prevent disease through diet and lifestyles. It is hoped by addressing the research aims of this thesis it will be possible to inform clinical practice.

Aims of thesis

From the summary of the literature presented, it would appear neglectful to examine heart disease without considering the impact of the role of both depression and anxiety as a risk for the onset and the progression of CHD. This thesis aims to address the gaps in knowledge by extending the current understanding of how the role of depression and anxiety affects the development and the progression of CHD. To address these gaps in knowledge, this thesis has three main themes. In addressing these aims, CHD is the term used throughout the chapters that follow, except in Chapter 2. In this chapter, CVD and subtypes of CHD are used to be consistent with the current evidence.

The first aim focuses on resolving uncertainties in the current evidence about the role of depression and anxiety on the risk of heart disease in healthy populations, using data from a large population-based survey called the 45 and Up study. The second aim is to examine whether CR is an effective intervention to reduce depression and anxiety in cardiac patients. In the first instance, a systematic review of the literature investigates this
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aim. A second investigation uses a mixed methods approach to examine this aim in a sample of patients recently discharge from hospital after a cardiac event. The third aim explores how the role of depression and anxiety impacts on cardiac patients’ recovery by examining the impact of depression and anxiety on the decision to attend CR using a mixed methods approach.

By using a large population-based study, this study aims to explain previously identified inconsistencies, and extend the current evidence by examining not just the role of anxiety as a risk, but also the risk of comorbid anxiety and depression. This study explores these risks separately in men and women. In this chapter, the focus is on incident cases of CHD, particularly ACS. The ICD-10 classification system is used to define incident cases of ACS, AMI, and unstable angina, and in order to be able to more easily compare findings of previous studies a decision was made to include CVD.

Once a person has had a heart attack, the role of depression and anxiety can impact their recovery. From the current evidence available it is not entirely understood how successful community-based CR interventions used by cardiac patients are at reducing depression and anxiety. A systematic review in Chapter 3 assesses the current evidence to gain a better understanding of whether current practice is effective at reducing depression and anxiety, or whether alternative interventions are needed to improve patients’ psychological distress and therefore improve quality of life and cardiac outcomes.

Using a mixed methods approach the role of depression and anxiety in how patients make the decision to attend, and complete CR is explored. This approach
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examines the effectiveness of CR at reducing depression and anxiety by comparing those who attended CR with those who either did not attend or did not complete CR.

A mixed methods approach to research is defined as an integration or combination of collecting and analysing both quantitative and qualitative data to provide an answer to research questions (Creswell & Zhang, 2009). Inquiry in mixed methods research is pragmatic, in that it is not committed to any one philosophy or theory of knowledge. Rather, this approach hinges on the assumption that the best way to answer a research problem is to collect a diverse range of data that is best suited to the needs and purpose of the particular research (Creswell, 2003).

For the purpose of this thesis, Chapters 4 and 5 used self-report questionnaires for the screening of cardiac patients to identify those with elevated levels of depression and anxiety symptoms. It was deemed that this method of screening for depression and anxiety would be both efficient and less onerous for the participants completing questionnaires, therefore allowing a greater number of participants to be included in the study. In Chapters 4 and 5 where self-report measures are used for anxiety and depression symptoms, the term psychological distress is used to mean both depression and anxiety.

**Roadmap of thesis chapters**

The following chapters attempt to address the aforementioned gaps in the current evidence.

**Chapter 2.** The first aim explores depression and anxiety as a risk for CHD. The research question in this chapter uses information collected from a large longitudinal study called the 45 and Up Study, which examines healthy ageing within NSW. The
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advantage of using these data is being able to take a lifelong approach to the complexities of the relationship between depression, anxiety and heart disease, by using a large sample.

**Chapter 3.** This chapter provides an overview of the evidence looking at the effectiveness of CR as a program that can effectively reduce cardiac patients’ depression and anxiety. A systematic review is used to increase our understanding of whether CR is meeting the needs of patients with elevated levels of depression and anxiety symptoms.

**Chapter 4.** Using self-report questionnaires this chapter examines the effect of psychological distress on how cardiac patients make the decision to attend CR by understanding the influence of treatment beliefs, illness beliefs and the intention to attend. Using quantitative methods, the best predictors for attending and completing CR and the effectiveness of CR at reducing symptoms of depression and anxiety are explored.

**Chapter 5.** Using semi-structured interviews for a more in-depth investigation, a qualitative study retrospectively explores the relationship of psychological distress on how people made the decision to attend or not attend CR, and the effects depression and anxiety have on recovery.

**Chapter 6.** Discussion and conclusion chapter. In this final chapter, the findings are discussed, and recommendations for future research and clinical implications presented.
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Chapter 2 - The relationship between depression and anxiety and the onset of cardiovascular disease

Overview

An increasing amount of research has found depression to be a risk for the onset of CHD (Nicholson et al., 2006; Rugulies, 2002; Wulsin & Singal, 2003) and CVD (Rutledge et al., 2009; Van Der Kooy et al., 2007). However, there are shortcomings to these data which mean that the potential relationship needs further exploration. The role of anxiety as a potential risk factor for CVD and CHD has been less researched, and there is much inconsistency in the findings documented. Similarly, the risk posed by comorbid depression and anxiety, in terms of the onset of CVD and its most common form, CHD, is not well researched, despite the high rate of comorbidity between depression and anxiety (Kessler et al., 2005). Identifying the extent to which anxiety and depression may be risk factors for the onset of CVD is important. As depression and anxiety are common, understanding whether they pose a risk for the onset of CVD is essential for guiding the design of CVD prevention activities.

Evidence for depression as a risk for CHD and CVD

It would appear that there is evidence to support the role of depression as a risk factor for CHD. It is important to determine whether depression and anxiety are risks for the onset of heart disease or not, as this will help inform their management in clinical practice. Heart Foundations of different countries differ in their positions on depression as a risk factor. Indeed, the National Heart Foundation of Australia in its publications
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includes depression as a risk for heart disease, along with the more traditional risk factors (National Heart Foundation of Australia, 2015). In presenting depression as a risk, they cite an evidence-based position statement that explored depression as a risk for heart disease (Bunker et al., 2003). Other international heart foundations of Britain and the United States do not present depression as a risk for heart disease, whereas the Canadian Heart and Stroke Foundation indicates stress as being a risk factor that can be controlled, but not depression (Canadian Heart And Stroke Foundation, 2015). The area examining both depression and anxiety as risk factors for heart disease has witnessed many articles in recent years; therefore, regular updates are required to ensure the most relevant information is available to both the general public and health professionals.

Recent meta-analyses have pooled the results of these cohort studies and found support for the association between depression and the risk of incident coronary heart disease, reporting pooled relative risks between 1.6 and 1.8 (Nicholson et al., 2006; Rugulies, 2002; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). However, Nicholson et al., (2006) concluded that although the results from their meta-analysis showed a significant association between depression and CHD, it was not possible to be conclusive about depression being an independent risk factor for CHD due to studies not properly adjusting for conventional CHD risk factors.

Moreover, although meta-analyses have a number of strengths, including increased statistical power and generalisability of their findings due to the pooling of data from multiple and often diverse samples, they are limited in their ability to produce meaningful findings if heterogeneity is detected between the included studies (Finckh & Tramer, 2008). When heterogeneity is detected, it indicates the variation in the clinical
and methodological findings among studies are not by chance (Tacconelli, 2010).
Heterogeneity can arise if there are differences between the pooled studies regarding: the
way the main exposure or outcome is measured; the set of confounding variables for
which statistical adjustment is made; or the characteristics of the samples studied if the
relationship being studied differs according to participant characteristics. Such
differences between studies make it inappropriate for their findings to be pooled, and
results in pooled estimates of risk that are not meaningful and should not be over-
interpreted (Deeks, Higgins, & Altman, 2011). This is a limitation of the current evidence
regarding the relationship between depression and incident CVDs. Of the recent meta-
analyses on this topic, only two have measured heterogeneity, finding statistically
significant heterogeneity between the pooled studies (Nicholson et al., 2006; Van Der
Kooy et al., 2007).

Pooling data from studies using different measures and different thresholds for
identifying depression can be inappropriate. One meta-analysis found the association
between depressive disorders and CHD was stronger than the relationship between
depressive symptoms and CHD (Rugulies, 2002). Another meta-analysis concluded
depression was a risk for the onset of CHD using both self-rating scales and structured
diagnostic interviews for depression (Wulsin & Singal, 2003). Both meta-analyses were
criticised for ignoring heterogeneity and methodological quality (Van Der Kooy et al.,
2007). Without the inclusion of a measure of heterogeneity, it is unclear how meaningful
the results are from these reviews.
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Variation in the measurement of outcomes is also problematic. Although all previous meta-analyses have attempted to break down CVDs into subtypes, such as AMI, CAD, and CHD death, it is not clear how consistent these classifications of CVD subtypes are across the included cohort studies (Nicholson et al., 2006; Rugulies, 2002; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). This lack of consistency renders the meaningfulness of their findings questionable, as the meta-analyses that tested for heterogeneity found substantial variation between the findings of studies measuring different types of CVD. The only subtype of CVD where heterogeneity was not substantial when measured separately was AMI (Van Der Kooy et al., 2007). This variation in results between studies poses the question is it possible that the effect of depression on a risk differs between the subcategories of CVD?

An additional weakness of the existing evidence regarding the relationship between depression and CHD is that not all meta-analyses, nor their constituent cohort studies, stratified their analyses according to the sex of participants. Recent evidence suggests that women’s CHD differs from men’s CHD in the symptoms they experience, the accuracy of diagnostic testing and the outcomes of treatments (Rollini, Mfeukeu, & Modena, 2009). It is thought this is due to the cardioprotective effects of endogenous oestrogens since CHD does not tend to manifest in women until after menopause (Shaw & Bugiardini, 2009). In the Australian population, the prevalence of CHD among women aged 45-64 years is 2.5%, compared to 9.3% among men. Between 60-69 years, the prevalence of CHD for women is 21% and 30% for men (AIHW, 2009). Over the age of 80, the female prevalence of CHD is 24%, compared with 15% for men. Given that women tend to be older when they develop CHD, they have a higher prevalence of
comorbid conditions compared with men (Rollini et al., 2009). Women are twice as likely to have a major depressive disorder compared to men but are not twice as likely to develop CHD (Seedat et al., 2009). These differences suggest that studies should examine these relationships for men and women separately.

The only meta-analysis to examine the relationship between depression and incident CVD by sex and CVD subtype (Van Der Kooy et al., 2007) confirmed the importance of examining this relationship separately for men and women. Of the eight studies presenting sex-specific results that were included in the review, a relationship between depression and CVD was reported in only females in one study (Whooley et al., 1998) in only males in three studies (Ford, Mead, & Chang, 1998; Gump, Matthews, Eberly, & Chang, 2004; Sesso, Kawachi, Vokonas, & Sparrow, 1998) and in both men and women in one study (Ferketich, 2000). When the meta-analysis was stratified by CVD subtype only, heterogeneity was found to be an issue. When the analysis was further stratified by sex, heterogeneity was not observed to be a problem for women. However, this was not the case for males (Van Der Kooy et al., 2007). This evidence confirms that stratification by sex is important, but also indicates stratification by sex is not sufficient, as other factors are still contributing to heterogeneity between studies of males.

An additional source of heterogeneity between studies that have been included in recent meta-analyses arises from not having access to the same variables to use in adjustment for potential confounding. In one meta-analysis including 21 studies, ten studies were found not to adjust for known coronary risks, many of which are known to be associated with depression, such as smoking, physical activity, body mass index and
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alcohol consumption. The pooled estimate was 1.52 (95% CI 1.21-1.90) in the 11 studies that adjusted for conventional cardiac risk factors compared to 2.08 (95% CI 1.69-2.55) in the unadjusted models (Nicholson et al., 2006). As it is not known whether established risk factors for CVD have a causal pathway between depression and CVD or whether depression is on the causal pathway between these factors and CVD, running adjusted and unadjusted models should be examined to explore the relationship. It is unclear whether adjustments are wise. Therefore it is best if both models are presented.

Evidence for anxiety as a risk for CHD and CVD

Evidence for anxiety as a risk factor for CHD is not as abundant or consistent as that for depression. An Expert Working Group of the National Heart Foundation of Australia, in a review of systematic reviews, found evidence for the association between depression and CHD for both men and women but did not find anxiety to be a risk factor for CHD (Bunker et al., 2003). In contrast, a more recent meta-analysis, which pooled data from 20 studies, including approximately 250,000 participants, found a hazard ratio of 1.26 (CI 95% 1.15 – 1.38) for the association between anxiety symptoms and incident cardiac events (Roest et al., 2010). Heterogeneity was substantial in the pooled studies, which indicates inconsistencies in the results. As the constituent studies differed in the way, anxiety and CHD were measured, and in the sample composition (e.g., sex), this heterogeneity is not surprising. Further support for the role of anxiety can be found from two studies not included in the Roest et al. (2010) review. A prospective cohort study found that somatic symptoms of anxiety were associated with an increased risk of CHD in a cohort aged between 20 and 54 years (Nabi et al., 2010). Similarly, a large cohort study examining the risk of both clinically diagnosed depression and anxiety in 49,321
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young men, found only anxiety to be a risk for CHD at follow-up 37 years later (Janszky et al., 2010). This large cohort study had relatively good power, a limitation of this study was it only observed a male population and at follow-up, the men would have still been relatively young; therefore, the authors concluded it was not possible to rule out depression being related to cardiovascular outcomes at a later follow-up. Similar to the studies supporting an association between depression as a risk, anxiety appears to have experienced comparable issues with heterogeneity.

The potential risks of comorbid anxiety and depression

Anxiety and depression are often comorbid (Suls & Bunde, 2005). People with depression and anxiety are at an increased risk of associated poor lifestyle choices, such as smoking, drinking, not being physically active and poor diet that increases their risk of CHD (Kop & Plumhoff, 2006). However, the direction is unclear: whether depression and anxiety are the results of poor lifestyle choices or vice-versa. Although symptoms of anxiety and depression co-occur in patients with CHD, relatively little is known about their combined effects on CHD risk. A few prospective cohort studies to date have examined the independent versus the interactive effects of anxiety and depression on CHD. A study examining a large female population found those with a history of comorbid depression and anxiety were likely to have poorer cardiac outcomes, with the strength of the relationship between a history of depression and CHD outcome varying by the severity of the comorbid anxiety (Rutledge et al., 2009). The focus of this study, however, was the relationship between comorbid depression and anxiety and outcomes after suspected myocardial ischemia, rather than the onset of AMI or other CVD in a previously CVD-free sample.
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A study that examined the association between clinically diagnosed depression and anxiety and the onset of CVD found having either a depressive or anxiety disorder was associated with the onset of CVD. However, CVD onset in people with a depressive disorder was predominantly associated with a comorbid anxiety disorder (Vogelzangs et al., 2010). The authors concluded it was not possible to make any assumption about the causality between anxiety, depression, and CVD as this was a cross-sectional study. This study focused on the comorbidity of anxiety and depression and CVD onset, while, to my knowledge, only one study has examined the role of comorbid depression and anxiety in CHD onset. The aforementioned study, based on 11,828 women, found comorbid anxiety and depression to be associated with the onset of CHD even after adjusting for health status, lifestyle behaviours and socioeconomic status (SES), with an odds ratio of 1.78 (CI 95% 1.41-2.24) (Berecki-Gisolf et al., 2013). Given the importance of determining whether psychological factors are risks for CHD onset, it would be valuable to examine whether this finding is robust in other samples and whether the same relationship holds for men and other subtypes of heart disease, such as AMI.

Aims

Given the heterogeneity between studies conducted thus far in this field, further meta-analyses are unlikely to resolve the uncertainty regarding the role of depression and anxiety in the onset of CVD. Instead, a large-scale cohort study, using consistent measures for all participants, and a large enough sample to allow for stratification by CVD subtype and sex, and adjustment for a broad range of potentially confounding variables has the potential to resolve some of the inconsistencies and shortcomings in the existing evidence. The current study includes a cohort of 143,815 participants. To address
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the problems discussed of examining depression and anxiety alone, comorbid depression and anxiety will also be included.

Specifically, this study aims to:

1. To determine whether a history of depression, anxiety, and comorbid depression and anxiety are associated with incident CVD
2. To determine whether the association between these psychological factors and CVD differ according to sex and the type of CVD, including ACS, MI, and unstable angina.

Method

Data sources and linkage.

Baseline questionnaire data from the Sax Institute’s 45 and Up Study (www.saxinstitute.org.au) were linked to records from the NSW Admitted Patients Data Collection (APDC) and death records from the NSW Register of Births Deaths and Marriages (RBDM).

The 45 and Up Study is a cohort study of men and women aged 45 and older and resident in NSW, Australia. Prospective participants were randomly sampled from the enrolment database of Medicare Australia, which provides near complete coverage of the population. People resident in non-urban areas and those aged 80 and older were oversampled. A total of 267,153 participants joined the study by completing a baseline questionnaire (please see Appendix A) between January 2006 and December 2009 and gave signed consent for linkage of their questionnaire data to routine health databases.
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About 18% of those invited agreed to participate, a response rate consistent with other cohort studies of this nature. Participants include about 10% of the NSW population aged 45 and over. Baseline questionnaire data included information on key demographic and health-related factors, including the level of education, smoking, alcohol use, physical activity, height and weight and medical and surgical history. Further details regarding the 45 and Up Study methods can be found elsewhere (Banks et al., 2008).

The APDC includes records for all hospital separations (discharges, transfers, and deaths) from all NSW public and private sector hospitals and day procedure centres. The information reported includes patient demographics diagnoses (up to 55) and procedures (up to 50), coded according to the Australian modification of the International Statistical Classification of Diseases and Related Problems, 10th revision (ICD-10-AM) (National Centre for Classification in Health, 2006). The APDC data used in the current study related to all separations between 1 July 2000 and 31 December 2010 (inclusive).

The NSW RBDM captures details of all deaths registered in NSW. The data used in the current study related to deaths of 45 and Up Study participants between 1 January 2006 and the end of the study period. (31 December 2010).

Probabilistic linkage of these datasets was performed by the Centre for Health Record Linkage (CHeReL) using the ‘best practice’ protocol for preserving individual privacy (Kelman, Bass, & Holman, 2002). Quality assurance data show false positive and negative rates for data linkage of 0.4% and less than 0.1% respectively (Kelman & Bass, 2002).
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Participants

Participants who completed Version 1 of the 45 and Up Study questionnaire, in which no distinction was made between a history of depression and anxiety (n=37,099), were excluded. A further 3762 participants were excluded as their recorded survey completion date was before the release of Version 2 of the questionnaire on 1st October 2007. As cancer and its treatments may affect CVD risk (Banks et al., 2013), all participants who reported a history of cancer in the baseline survey were excluded. A history of cancer was determined using the questions “have you ever been told by a doctor that you have breast cancer?” (women), “have you ever been told by a doctor that you have prostate cancer?” (men), “have you ever been told by a doctor that you have other cancer?” (both men and women). As the main outcome variable of interest was the first hospitalisation for CVD or one of its subtypes, all participants with a history of heart disease or stroke, as recorded in the survey, were excluded, leaving a sample of 177,497. The linked APDC records were also used to identify and exclude 33,598 participants with a history of CVD, with all records of admissions prior to the date of survey completion searched, this was a minimum period of 7 years and three months. If a participant had at least one APDC record with one of the following ICD-10-AM diagnosis or procedure codes in any of the diagnosis or procedure fields respectively, they were considered to have a history of CVD: Diagnosis codes I00-I99, G45, G46 and procedure codes for revascularizations (please see Appendix B for a full breakdown of all diagnosis and procedure codes used). Missing data categories were created for those covariates where it would not result in small cell sizes, and therefore
be potentially identifying. Where this was not possible, participants with missing data were excluded, leaving a sample of 143,815.

**Sample Characteristics**

Questionnaire data were used to categorise participant age at baseline. Age was broken down into ten year age groups up until the age of 85, with a separate category for all participants over the age 85 years. For both depression and anxiety, the age of onset of either condition was measured from the self-report questions “age when condition was first found”. This variable was used for describing the sample characteristics.

**Measurement of the exposures and outcomes**

Questionnaire data was used to determine whether, at baseline, participants had a previous history of depression and/or anxiety using the questions “have you ever been told by a doctor that you have depression?” and “have you ever been told by a doctor that you have anxiety?” From these, an indicator of depression and anxiety was created for all participants: 1) depression, no anxiety; 2) anxiety, no depression; 3) depression and anxiety; and 4) no depression, no anxiety.

CVD and its subtypes were measured through hospital admissions for these conditions using APDC data. APDC records were used to identify all hospitalisations for CVD, ACS, AMI and unstable angina occurring after the baseline survey was completed, which, by design, can be considered incident cases given that participants with a history of CVD at baseline were excluded. CVD outcome was identified by the presence of at least one of the above-listed ICD-10-AM diagnosis codes or procedure codes in the primary diagnosis or first procedure code field. To be able to focus on CHD, this was further broken down to incident ACS, identified through diagnosis codes I21, I20.1 and
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ACS-related procedure codes (see Appendix B), AMI, identified through diagnosis code I21, and unstable angina, identified through diagnosis code I20.0.

**Measurement of potential confounding factors and covariates**

An unadjusted model and two adjusted models were built separately for each CVD subtype. The first adjusted model forced all established risk factors associated with CVD into the model. A second adjusted model also forced all established risk factors for CVD into the model, in order to be able to adjust for potential risk factors and confounding variables. A stepped approach was used to enter all covariates that are not considered to be established risks. All covariates and confounding variables were measured via self-report in the 45 and Up Study baseline questionnaire.

**Adjusted model – established risk for CVD**

The first adjusted model only contained all previously established risk factors for CVD. The second adjusted model contained all previously established risk factors for CVD, as well as additional factors, found to be significant in univariate analyses.

The established risk factors forced into the first adjusted model included age, presence of high blood pressure, diabetes, high cholesterol, a family history of heart disease and stroke (World Health Organisation, 2015) and the established behavioural risk factors which included tobacco use, unhealthy body mass index (BMI), physical inactivity, poor diet, and excessive use of alcohol (Nicholson et al., 2006) which could all potentially confound the relationship between depression and/or anxiety and heart disease.
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Diabetes, high blood pressure, and high cholesterol were identified from the questions asking whether participants had “ever been told by a doctor” they had diabetes; whether “in the last month had [they] been treated for” high blood pressure and high blood cholesterol. Body mass index (BMI), weight in kilograms divided by height in metres squared) was categorised into different levels based on WHO weight classifications (World Health Organisation, 2006), 15-18.49 (underweight), 18.5-24.9 (healthy weight), 25-29.9 (overweight) 30-50 (obese). Physical activity was measured using the Active Australia Questionnaire (Australian Institute of Health and Welfare, 2003), and the following categories were created: sufficient activity (30 minutes of activity 5 days a week), low activity (less than 30 minutes of activity 5 days per week), and no activity a week.

Adjusted models - established risks for CVD, including other covariates

In a second adjusted model, all variables that are established risk factors for CVD were forced into the model (as in the previous model). Additional variables that have not been identified as established risk factors for CVD were added into the model using a stepwise approach. These extra variables were marital status, education, annual pre-tax household income, and education. Socio-economic status (SES) was classified according to the Socioeconomic Indexes for Areas Index of Relative Socioeconomic Disadvantage (SEIFA IRSD), mapped to a participant’s statistical local area (SLA) of residence at the time of survey completion and grouped into quintiles with quintile 5 indicating the highest SES and quintile 1 indicating the lowest SES (Australian Bureau of Statistics, 2008). Remoteness of residence was classified according to the Accessibility and Remoteness Index of Australia (ARIA+) (Australian Bureau of Statistics, 2005) applied
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to SLA of residence, and grouped into four categories (major city, inner regional, outer regional, and remote/very remote). The Kessler-10 scale (K-10) measured psychological distress (<20, no distress; 20-24, mild distress; 25-29, moderate distress; 30 and over, severe distress) (Kessler & Mroczek, 1994).

Self-rated health was assessed using the question ‘In general, how would you rate your health overall?’ Participants were asked to circle an appropriate response from 5 options (excellent, very good, good, fair, poor); self-rated quality of life was assessed using the question ‘In general, how would you rate your quality of life?’ Participants had five options and were asked to circle the most appropriate response (excellent, very good, good, fair, poor). In women, menopausal status was categorised into yes (have been through menopause), no (have not been through menopause), and not sure (because of hysterectomy, taking hormone replacement therapy). In women hormone replacement therapy (HRT) use was determined by the question ‘have you ever used hormone replacement therapy (HRT)?’ It was not possible to determine whether participants had ever been treated for depression and/or anxiety, however, it was possible to determine whether participants had been treated for depression and anxiety in the last month, ‘in the last month have you been treated for depression’, “in the last month have you been treated for anxiety”, these were used, to create two variables, treated for depression ‘yes/no’, treated for anxiety ‘yes/no’.

**Statistical analysis**

All analyses were performed using SAS version 9.3 (SAS Institute, 2011).

Descriptive statistics were reported as mean (standard deviation) or frequencies with percentages.
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Cox proportional hazard regression models assessed the association between having neither depression nor anxiety, having depression only, having anxiety only and having both anxiety and depression and the CVD outcomes. For each participant, a time to event was calculated as the number of days between the date of survey completion and the participant’s first hospitalisation for CVD, ACS, AMI or unstable angina admission. In each model, the outcome of interest was considered the end point, except for participants who did not experience an event; these cases were censored using the end of study date or death (30th December 2010). Eight Cox regression proportional hazard models were built; this included separate models for males and females, and separate models for each CVD outcome (CVD, ACS, AMI and unstable angina). All established risk factors were forced into the models; extra covariates were only retained in the models if they had a significant effect at 5% or 10% level of significance. Hazard ratios (HRs) and 95% confidence intervals (CIs) were reported.

The Cox regression model method allowed for the censoring of all non-events and the assumption of proportional hazards (PH) was assessed in a few ways. Firstly, the PH assumption was checked by visual examination of Kaplan-Meier curves (for categorical variables) and scaled and smoothed Schoenfeld residuals (continuous variables). Secondly, a formal Wald test was performed for each variable x by including the time-varying interaction xin(t) in the proportional hazards model. Finally ASSESS was employed to test the proportionality assumption of the hazard ratios was constant over time (Lin, Wei, and Ying, 1993). Proportionality tests for all covariates produced results that indicated a good fit, with the exception of a family history of high blood pressure. As a result, it was decided to exclude this covariate from the analysis. All explanatory
variables were tested for multicollinearity by examining variance inflation factor (VIF) and eigenvalues, and no variables were found to be significantly correlated with each other.

The conduct of the 45 and Up Study was approved by the University of New South Wales Human Research Ethics Committee (HREC), while ethical approval for this particular study was provided by the NSW Population and Health Services Research Ethics Committee and the University of Western Sydney HREC. Written informed consent was given by participants for their health records to be used in this study, and data were de-identified prior to release to the researchers. The dataset was constructed with the permission of each of the data custodians of the respective source datasets and with specific ethical approval.

**Results**

**Sample characteristics.**

This sample of 143,815 participants, who at baseline were free of CVD, was comprised of 60,298 men and 83,517 women. The sample ranged in age from 45 to 103 years with the mean age for both men and women being 60 years (SD= 10 years). The majority of both men (71.6%) and women (74.0%) were aged between 45 and 65 years of age. Characteristics of the participants, broken down by sex and their depression and/or anxiety status, are shown in Table 1. The percentage of participants that reported ‘ever being told by a doctor’ that they had either depression and/or anxiety was 13.4% for men and 21.6% women. This can be broken down further for men, 6.7% of the sample had depression, 2.6% anxiety, and 4.1% had comorbid anxiety and depression. For women,
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10.6% had depression, 4.5% anxiety, and 6.5% had both anxiety and depression. Using the responses from self-report questions the mean age for men being told they had depression was 45 years (SD 11.7) and 43.6 years (12.8) for anxiety, in women the mean age for being told they had depression was 42 years (12.6 SD) and anxiety 43 years (13.3 SD). Depression, anxiety and comorbid depression and anxiety were more prevalent in women than in men. More women (10.6%) than men (6.7%) reported being told by a doctor that they had depression. This pattern was also observed with anxiety, with it being more prevalent in women (4.5%) than men (2.6%). Comorbid anxiety and depression was also more prevalent in women (6.5%) than men (4.1%).

There was a higher prevalence of smokers among both men and women with depression (men=13%, women=11%), anxiety (men=9.1%, women=7.3%) and comorbid anxiety and depression (men=17.5%, women=14%), than smokers with no depression or/and anxiety (men=8%, women=6.2%). A family history of heart disease was similar for those with or without depression and/or anxiety, with women (45.6%) reporting a slightly higher family history of heart disease than men (37.5%), as was having a family history of stroke (men=23.2%, women=25.7%). A higher percentage of men (6.7%) had diabetes than women (4.5%).

The majority of participants resided in major cities in NSW (45.4% of men and 43.7% of women). Only 2% of men and women lived in remote areas, with 18.2% of men and 18.3% of women living in outer regional NSW. The majority of both men (84.6%) and women (73.3%) were married. In this sample, a high school education or higher was obtained for the majority of participants (men 81.2%; and women 89.6%).
Characteristics of incident CVD

Mean follow-up time for participants was 2.4 years for both men and women (Table 2). The mean age at baseline for participants who developed incident CVD in this sample is 65.5 years (SD 11.8 years) for women and 65.2 years (SD 10.8 years) for men. For men the mean age at baseline for those who experienced an ACS was 65.6 years (SD 10.3 years) and for AMI 65.9 years (SD 11.02 years), whereas in women the mean age at baseline for those who experienced an ACS was 67.3 years (SD 11.32) and for AMI 69.5 years (SD 12.4 years). The mean age of onset of unstable angina was similar in both men and women at 64.3 years (SD 9.56 years) and 64.6 years (SD 9.81 years) respectively. Incident unstable angina had the fewest events with 236 (0.4%) cases for men and 151 (0.2%) for women.
### Table 1

**Characteristics of study population according to anxiety/depression status**

<table>
<thead>
<tr>
<th>Region of residence</th>
<th>Quintile 1</th>
<th>Quintile 2</th>
<th>Quintile 3</th>
<th>Quintile 4</th>
<th>Quintile 5</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote/very remote</td>
<td>11969(9.9)</td>
<td>10293(9.7)</td>
<td>866(21.5)</td>
<td>9178(5.8)</td>
<td>432(2.1)</td>
<td>11969(9.9)</td>
</tr>
<tr>
<td>Inner regional</td>
<td>12207(20.2)</td>
<td>10408(19.8)</td>
<td>881(21.9)</td>
<td>9178(5.8)</td>
<td>432(2.1)</td>
<td>12207(20.2)</td>
</tr>
<tr>
<td>Major city</td>
<td>14512(24.1)</td>
<td>12508(23.9)</td>
<td>1016(25.3)</td>
<td>9178(5.8)</td>
<td>432(2.1)</td>
<td>14512(24.1)</td>
</tr>
<tr>
<td>Outer regional</td>
<td>10045(13.3)</td>
<td>6983(13.4)</td>
<td>518(12.9)</td>
<td>9178(5.8)</td>
<td>432(2.1)</td>
<td>10045(13.3)</td>
</tr>
<tr>
<td>Remote/very remote</td>
<td>13565(22.5)</td>
<td>12084(23.1)</td>
<td>742(18.4)</td>
<td>9178(5.8)</td>
<td>432(2.1)</td>
<td>13565(22.5)</td>
</tr>
</tbody>
</table>

**Smoking status**

- Non smoker: 31454(52.2)
- Ex-smoker: 23550(39.1)
- Smoker: 5294(8.8)
- Diabetes: 4064(6.7)
- Family history of heart disease: 22591(37.5)
- Family history of stroke: 13966(23.2)
- Social economic status:
  - Quintile 1: 11969(9.9)
  - Quintile 2: 12207(20.2)
  - Quintile 3: 14512(24.1)
  - Quintile 4: 8045(13.3)
  - Quintile 5: 13565(22.5)

**Region of residence**

- Major city: 27388(45.4)
- Inner regional: 20721(34.4)
- Outer regional: 11012(18.2)
- Remote/very remote: 1177(2)

**Relevance of study population according to anxiety/depression status**

- Received diagnosis of anxiety and/or depression
  - Total N (%): 67595(22.5)
  - Men N=60298: 34520(57.2)
  - Women n=83517: 33075(27.9)

**Age at time of survey**

- Under 20 years: 220(3.1)
- 20 – 35 years: 1046(14.7)
- 35 – 45 years: 1924(39.0)
- 45 – 55 years: 2772(27.1)
- 55 – 65 years: 538(7.6)
- 65 – 75 years: 263(3.7)
- 75 – 85 years: 79(1.1)
- Over 85 years: 263(3.7)

**Economic status**

- Remote/very remote: 1177(2)
- Inner regional: 20721(34.4)
- Outer regional: 11012(18.2)
- Remote/very remote: 1177(2)
<table>
<thead>
<tr>
<th>Alcohol</th>
<th>Men N=60298</th>
<th>Women n=83517</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t drink</td>
<td>1079(1.8)</td>
<td>13197(18.3)</td>
</tr>
<tr>
<td>&lt;14 units a week</td>
<td>35475(58.8)</td>
<td>7817(9.4)</td>
</tr>
<tr>
<td>&gt;14 units a week</td>
<td>23744(39.4)</td>
<td>595(6.7)</td>
</tr>
<tr>
<td>BMI*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>333(0.6)</td>
<td>3357(71.7)</td>
</tr>
<tr>
<td>Normal</td>
<td>17632(31.1)</td>
<td>76(2)</td>
</tr>
<tr>
<td>Overweight</td>
<td>27162(47.9)</td>
<td>274(5.2)</td>
</tr>
<tr>
<td>Obese</td>
<td>11534(20.4)</td>
<td>27(0.9)</td>
</tr>
<tr>
<td>Active*</td>
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<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>14060(31.7)</td>
<td>10367(54.7)</td>
</tr>
<tr>
<td>Moderate</td>
<td>29549(66.6)</td>
<td>2495(63.5)</td>
</tr>
<tr>
<td>Vigorous</td>
<td>781(1.8)</td>
<td>1158(25.1)</td>
</tr>
<tr>
<td>Married*</td>
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<td></td>
</tr>
<tr>
<td>Single</td>
<td>4094(7.0)</td>
<td>2769(60.5)</td>
</tr>
<tr>
<td>Married or partnered</td>
<td>49163(84.6)</td>
<td>8523(19.1)</td>
</tr>
<tr>
<td>Widowed or separated</td>
<td>4838(8.3)</td>
<td>3194(7.1)</td>
</tr>
<tr>
<td>Education*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not complete school</td>
<td>5203(8.8)</td>
<td>2733(58.1)</td>
</tr>
<tr>
<td>High school or equivalent</td>
<td>37166(62.4)</td>
<td>2716(9.3)</td>
</tr>
<tr>
<td>University or higher</td>
<td>17073(28.7)</td>
<td>3071(67.3)</td>
</tr>
<tr>
<td>Work*</td>
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</tr>
<tr>
<td>Employed</td>
<td>37548(62.9)</td>
<td>3071(67.3)</td>
</tr>
<tr>
<td>Retired</td>
<td>17203(28.8)</td>
<td>3071(67.3)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>4917(8.2)</td>
<td>3071(67.3)</td>
</tr>
<tr>
<td>K10*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No distress</td>
<td>57502(95.9)</td>
<td>7704(87.5)</td>
</tr>
<tr>
<td>Mild distress</td>
<td>1368(2.3)</td>
<td>127(1.4)</td>
</tr>
<tr>
<td>Moderate levels of distress</td>
<td>608(1)</td>
<td>253(5.9)</td>
</tr>
<tr>
<td>High levels of distress</td>
<td>460(0.8)</td>
<td>175(3.4)</td>
</tr>
<tr>
<td>Language spoken at home other than English</td>
<td>6495(10.8)</td>
<td>267(7)</td>
</tr>
<tr>
<td>Treatment in last month for depression</td>
<td>2695(4.5)</td>
<td>267(7)</td>
</tr>
<tr>
<td>Treatment in last month for anxiety</td>
<td>1602(2.7)</td>
<td>267(7)</td>
</tr>
<tr>
<td>Menopause (women only)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premenopause</td>
<td>13197(18.3)</td>
<td>10311(18.2)</td>
</tr>
<tr>
<td>Peri menopause</td>
<td>5944(8.2)</td>
<td>4411(7.8)</td>
</tr>
<tr>
<td>Post menopause</td>
<td>53153(73.5)</td>
<td>41998(74)</td>
</tr>
</tbody>
</table>

*% represents valid percent, with participants with missing data excluded. ** age of onset refers to the first recorded episode for anxiety or depression, whichever occurred first.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Table 2

Incident CVD events

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Men N=60298</th>
<th></th>
<th></th>
<th>Total</th>
<th>Women n=83517</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CVD</td>
<td>ACS</td>
<td>AMI</td>
<td>Unstable angina</td>
<td>CVD</td>
<td>ACS</td>
<td>AMI</td>
</tr>
<tr>
<td>No anxiety/ depression</td>
<td>52240</td>
<td>49676</td>
<td>2564</td>
<td>51493</td>
<td>747</td>
<td>51869</td>
<td>380</td>
<td>52030</td>
</tr>
<tr>
<td>Depression only</td>
<td>4023</td>
<td>3809</td>
<td>1481</td>
<td>3963</td>
<td>60</td>
<td>3995</td>
<td>28</td>
<td>4004</td>
</tr>
<tr>
<td>Anxiety only</td>
<td>1550</td>
<td>1481</td>
<td>69</td>
<td>1531</td>
<td>19</td>
<td>1538</td>
<td>28</td>
<td>1543</td>
</tr>
<tr>
<td>Depression and anxiety</td>
<td>2485</td>
<td>2368</td>
<td>117</td>
<td>2453</td>
<td>32</td>
<td>2470</td>
<td>15</td>
<td>2474</td>
</tr>
</tbody>
</table>

Among male participants, 4.9% experienced a CVD event, for women this was 3.1%. As would be expected fewer events were reported in each subgroup for CVD, as they were broken down into subtypes, this was particularly the case for those with unstable angina as an outcome for participants with anxiety only and those with comorbid depression and anxiety groups. The small number of events in these subtypes of CVD, in particularly with unstable angina, meant in some cells there were very few events to detect a reasonable-size effect with reasonable power.
The relationship between depression and/or anxiety and incident CVD

The results contained in Table 3 and 4 contain only the final models, significant results for unadjusted models and partially adjusted models are reported in the text.

Results for men. Only depression, not anxiety alone or comorbid depression and anxiety, was found to be a risk for incident CVD among men after adjusting for age only and all established risk factors (Table 3).

Depression only. For men, a history of depression was a risk for the onset of CVD in all of the adjusted models, but not the unadjusted model. The model that adjusted for age only showing the strongest effect (hazard ratio (HR)=1.27, 95% confidence intervals (CI) 1.11-1.46), in the adjusted model including the established cardiac risks for CVD (HR=1.22, 95% CI 1.06-1.41) and a final model that adjusted for established cardiac risks and other potential confounders (HR = 1.15, 95% CI 1.01-1.33). The only significant covariates in the final model were self-report quality of health and self-report quality of life. In unadjusted and both adjusted models for all other CVD subtypes, ACS, AMI and unstable angina depression was not found to be associated with any significant risk.

Anxiety only. In all adjusted or unadjusted models for men, having anxiety was not a risk for incident CVD, ACS, AMI or unstable angina.

Comorbid depression and anxiety. In all adjusted or unadjusted models for men, having comorbid depression and anxiety was not a risk for incident CVD, ACS, AMI or unstable angina.
## ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

### Table 3

**Results for Men**

<table>
<thead>
<tr>
<th></th>
<th>CVD (HR 95% CI)</th>
<th>ACS (HR 95% CI)</th>
<th>AMI (HR 95% CI)</th>
<th>Unstable Angina (HR 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depression/anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Depression</td>
<td>1.22 (1.06-1.41)</td>
<td>1.15 (0.88-1.50)</td>
<td>1.10 (0.75-1.62)</td>
<td>1.26 (0.78-2.02)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0.98 (0.77-1.24)</td>
<td>0.91 (0.57-1.43)</td>
<td>1.17 (0.66-2.07)</td>
<td>1.19 (0.56-2.52)</td>
</tr>
<tr>
<td>Both</td>
<td>1.11 (0.92-1.34)</td>
<td>1.03 (0.72-1.47)</td>
<td>0.97 (0.58-1.63)</td>
<td>1.21 (0.66-2.24)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-55</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>54-65</td>
<td>1.61 (1.45-1.79)</td>
<td>1.60 (1.32-2.00)</td>
<td>1.58 (1.20-2.09)</td>
<td>1.47 (1.02-2.10)</td>
</tr>
<tr>
<td>64-75</td>
<td>2.56 (2.29-2.86)</td>
<td>3.21 (2.62-3.94)</td>
<td>2.62 (1.96-3.50)</td>
<td>2.99 (2.08-4.31)</td>
</tr>
<tr>
<td>74-85</td>
<td>4.04 (3.56-4.60)</td>
<td>4.14 (3.26-5.26)</td>
<td>4.54 (3.29-6.27)</td>
<td>3.03 (1.92-4.79)</td>
</tr>
<tr>
<td>85+</td>
<td>6.87 (5.58-8.47)</td>
<td>5.63 (3.60-8.64)</td>
<td>7.00 (4.12-11.87)</td>
<td>1.38 (0.33-5.750)</td>
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<tr>
<td><strong>Smoking</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>Non-smoker</td>
<td>1</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>1.08 (1.00-1.17)</td>
<td>1.02 (0.88-1.18)</td>
<td>1.07 (0.87-1.32)</td>
<td>0.88 (0.67-1.16)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>1.42 (1.25-1.61)</td>
<td>1.74 (1.39-2.18)</td>
<td>2.02 (1.49-2.73)</td>
<td>1.60 (1.07-2.40)</td>
</tr>
<tr>
<td><strong>Diabetes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.21 (1.07-1.37)</td>
<td>1.54 (1.25-1.88)</td>
<td>1.28 (0.93-1.76)</td>
<td>1.63 (1.12-2.37)</td>
</tr>
<tr>
<td><strong>Family history of CHD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.28 (1.19-1.38)</td>
<td>1.48 (1.30-1.70)</td>
<td>1.42 (1.17-1.72)</td>
<td>1.42 (1.10-1.82)</td>
</tr>
<tr>
<td><strong>Family history of stroke</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.02 (0.94-1.11)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Family history of high blood pressure</strong></td>
<td></td>
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<tr>
<td>No</td>
<td>1</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>0.98 (0.90-1.06)</td>
<td>0.98 (0.85-1.13)</td>
<td>0.88 (0.66-1.19)</td>
<td>0.98 (0.91-2.13)</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
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<tr>
<td>Underweight</td>
<td>1</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Healthy</td>
<td>0.59 (0.41-0.84)</td>
<td>0.68 (0.32-1.45)</td>
<td>0.41 (0.19-0.89)</td>
<td>0.69 (0.16-8.36)</td>
</tr>
<tr>
<td>Overweight</td>
<td>0.68 (0.47-0.98)</td>
<td>0.88 (0.43-1.93)</td>
<td>0.46 (0.22-0.99)</td>
<td>0.94 (0.18-1.16)</td>
</tr>
<tr>
<td>Obese</td>
<td>0.77 (0.53-1.12)</td>
<td>0.96 (0.45-2.07)</td>
<td>0.55 (0.25-1.21)</td>
<td>0.92 (0.32-2.34)</td>
</tr>
<tr>
<td>Active</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.91 (0.83-1.00)</td>
<td>0.84 (0.70-0.99)</td>
<td>0.85 (0.67-1.08)</td>
<td>0.78 (0.56-1.07)</td>
</tr>
<tr>
<td>Vigorous</td>
<td>1.14 (0.82-1.58)</td>
<td>0.99 (0.53-1.87)</td>
<td>1.18 (0.52-2.70)</td>
<td>0.69 (0.17-2.83)</td>
</tr>
<tr>
<td><strong>Current treatment for chols</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.12 (1.01-1.24)</td>
<td>1.19 (0.99-1.43)</td>
<td>0.88 (0.66-1.19)</td>
<td>1.31 (0.93-1.84)</td>
</tr>
<tr>
<td>Adequate fruit and veg</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adequate</td>
<td>1.07 (0.98-1.16)</td>
<td>1.26 (1.10-1.45)</td>
<td>1.22 (1.01-1.48)</td>
<td>1.60 (1.16-2.19)</td>
</tr>
<tr>
<td>Low</td>
<td>1.03 (0.93-1.14)</td>
<td>1.03 (0.93-1.14)</td>
<td>1.03 (0.93-1.14)</td>
<td>1.26 (0.87-1.83)</td>
</tr>
<tr>
<td><strong>Alcohol</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t drink</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 14 units a week</td>
<td>0.83 (0.66-1.04)</td>
<td>0.70 (0.48-1.04)</td>
<td>0.80 (0.46-1.40)</td>
<td>0.75 (0.35-1.56)</td>
</tr>
<tr>
<td>&gt;14 units a week</td>
<td>0.79 (0.62-0.10)</td>
<td>0.62 (0.41-0.92)</td>
<td>0.68 (0.38-1.21)</td>
<td>0.70 (0.32-1.52)</td>
</tr>
<tr>
<td><strong>Treatment for high blood pressure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>1.10 (1.01-1.19)</td>
<td>1.21 (1.05-1.40)</td>
<td>1.10 (0.90-1.36)</td>
<td>1.09 (0.83-1.43)</td>
</tr>
</tbody>
</table>

Covariates added into the stepwise adjusted regression model that did not have a significant effect were marital status; education; work; K10; other languages; treated for depression in last month; treated for anxiety in the last month.
Results for women. Depression only was associated with an increased risk of CVD in women. Having comorbid depression and anxiety was found to be a risk for incident CVD, ACS, and AMI in women. Anxiety alone was not found to be a risk for any CVD subtype (Table 4).

Depression only. For women, a history of depression was associated with an increased risk for CVD in only the models adjusting for age (HR=1.18, 95% CI 1.04-1.34) and for established CVD risks (HR=1.16, 95% CI 1.02-1.31).

Anxiety only. In all other analyses for women, having anxiety was not a risk for incident CVD, ACS, AMI or unstable angina.

Comorbid depression and anxiety. For women in this sample, having comorbid depression and anxiety was associated with an increased risk for CVD, ACS, AMI and unstable angina. For CVD the increased risk was observed in both the adjusted models and unadjusted model. The strongest effect was observed in the model that adjusted only for age (HR=1.45, 95% CI 1.25-1.68), in the adjusted model for established risk factors (HR=1.39, 95% CI 1.2-1.66), the adjusted model (HR=1.29, 95% CI 1.11-1.5) including covariates HRT use, quality of health and the unadjusted model. (HR= 1.17 95% CI 1.01-1.35).

When only adjusting for age, the strongest effects observed were for women with comorbid depression and anxiety; they had a 2.07 (95% CI 1.47-2.91) times greater risk of having incident ACS. When all established cardiac risks were entered into the models for ACS, although the effect was not as strong, comorbid anxiety and depression was still associated with an increased risk for ACS (HR=1.85, 95%CI 1.31-2.61). Similarly, an
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

increased risk was still observed when both established cardiac risks, and the additional covariates were included; these being quality of health and preeclampsia for ACS (HR=1.72, 95%CI 1.22-2.45).

For AMI when adjusting for age, there was a 2.25 (95% CI 1.49-3.84) times greater risk of having AMI than women with no history of depression and anxiety. When all established cardiac risks were entered into the models for AMI, although the effect was not as strong, comorbid anxiety and depression were still associated with an increased risk for AMI (HR=2.15, 95% CI 1.33-3.46). For AMI when both established cardiac risks, and the additional covariates were included, specifically education (HR=2.11, 95%CI 1.31-4.31).

In women, comorbid anxiety and depression increased the risk for unstable angina, although this was only when the model adjusted for age (HR=1.9, 95% CI 1.11-3.27).
### ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

**Table 4**

Results for women

<table>
<thead>
<tr>
<th>Depression/anxiety</th>
<th>CVD HR (95% CI)</th>
<th>ACS HR (95% CI)</th>
<th>AMI HR (95% CI)</th>
<th>Unstable angina HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither</td>
<td>1.00</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Depression</td>
<td>1.16*(1.02-1.31)</td>
<td>1.20 (0.86-1.67)</td>
<td>1.20 (0.74-1.95)</td>
<td>1.03 (0.60-1.77)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>1.02 (0.84-1.23)</td>
<td>0.92 (0.55-1.55)</td>
<td>1.06 (0.52-2.16)</td>
<td>0.92 (0.40-2.08)</td>
</tr>
<tr>
<td>Both</td>
<td>1.39*(1.20-1.66)</td>
<td>1.85*(1.31-2.61)</td>
<td>2.15*(1.33-3.46)</td>
<td>1.70 (0.98-3.07)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-55</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>54-65</td>
<td>1.49 (1.34-1.66)</td>
<td>1.67 (1.23-2.27)</td>
<td>1.55 (0.99-2.43)</td>
<td>1.94 (1.22-3.07)</td>
</tr>
<tr>
<td>64-75</td>
<td>2.31 (2.05-2.6)</td>
<td>3.35 (2.44-4.61)</td>
<td>2.73 (1.69-4.39)</td>
<td>2.96 (1.80-4.87)</td>
</tr>
<tr>
<td>74-85</td>
<td>4.30 (3.77-4.9)</td>
<td>6.02 (4.24-8.54)</td>
<td>7.91 (4.93-12.7)</td>
<td>4.14 (2.33-7.35)</td>
</tr>
<tr>
<td>85+</td>
<td>7.08 (5.87-8.55)</td>
<td>9.68 (6.00-15.61)</td>
<td>18.73 (10.67-32.84)</td>
<td>0.86 (0.12-6.42)</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-smoker</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>1.05 (0.96-1.15)</td>
<td>1.18 (0.94-1.49)</td>
<td>1.14 (0.82-1.59)</td>
<td>1.20 (0.83-1.73)</td>
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<td>Current smoker</td>
<td>1.21 (1.04-1.42)</td>
<td>2.01 (1.42-2.86)</td>
<td>2.15 (1.31-3.51)</td>
<td>1.69 (0.95-3.03)</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
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<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Yes</td>
<td>1.04 (0.88-1.23)</td>
<td>1.51 (1.06-2.14)</td>
<td>1.24 (0.73-2.13)</td>
<td>1.77 (1.03-3.01)</td>
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<tr>
<td>Family history of CHD</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Yes</td>
<td>1.17 (1.08-1.27)</td>
<td>1.16 (0.94-1.41)</td>
<td>0.91 (0.69-1.21)</td>
<td>1.52 (1.10-2.11)</td>
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<tr>
<td>Family history of stroke</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Yes</td>
<td>1.01 (0.93-1.10)</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<tr>
<td>Family history of high blood pressure</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Yes</td>
<td>1.02 (0.94-1.11)</td>
<td>1.15 (0.93-1.43)</td>
<td>1.19 (0.96-1.43)</td>
<td>2.15 (0.93-1.43)</td>
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<td>BMI</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under weight</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>Healthy</td>
<td>0.95 (0.70-1.29)</td>
<td>0.64 (0.34-1.23)</td>
<td>0.64 (0.28-1.47)</td>
<td>0.60 (0.18-1.92)</td>
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<td>Over weight</td>
<td>1.08 (0.79-1.46)</td>
<td>0.74 (0.38-1.41)</td>
<td>0.65 (0.28-1.51)</td>
<td>0.79 (0.25-2.55)</td>
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<td>1.21 (0.89-1.66)</td>
<td>0.82 (0.42-1.59)</td>
<td>0.88 (0.37-2.11)</td>
<td>0.83 (0.25-2.73)</td>
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<td>Active</td>
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</tr>
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<td>Sedentary</td>
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<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.95 (0.86-1.05)</td>
<td>1.12 (0.85-1.47)</td>
<td>1.55 (1.01-2.36)</td>
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<td>Vigorous</td>
<td>0.78 (0.52-1.19)</td>
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<td>0.74 (0.10-5.42)</td>
<td>0.00 (0.00-4.07)</td>
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<td>Current treatment for cholesterol</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Yes</td>
<td>1.00 (0.89-1.12)</td>
<td>0.79 (0.59-1.06)</td>
<td>0.80 (0.52-1.22)</td>
<td>0.92 (0.59-1.44)</td>
</tr>
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<td>Adequate fruit and veg</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate</td>
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<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Low</td>
<td>1.09 (0.99-1.20)</td>
<td>1.01 (0.83-1.24)</td>
<td>1.07 (0.81-1.43)</td>
<td>0.94 (0.64-1.37)</td>
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<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t drink</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>&lt; 14 units a week</td>
<td>1.02 (0.81-1.29)</td>
<td>0.98 (0.56-1.71)</td>
<td>1.06 (0.49-2.29)</td>
<td>0.75 (0.31-1.86)</td>
</tr>
<tr>
<td>&gt; 14 units a week</td>
<td>0.93 (0.72-1.20)</td>
<td>0.77 (0.40-1.46)</td>
<td>0.94 (0.39-2.29)</td>
<td>0.72 (0.26-1.97)</td>
</tr>
<tr>
<td>Treatment for high blood pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Yes</td>
<td>1.20 (1.10 – 1.31)</td>
<td>1.91(1.54-2.37)</td>
<td>1.80 (1.33-2.42)</td>
<td>1.78 (1.26-2.56)</td>
</tr>
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</table>

Covariates added into the stepwise adjusted regression model that did not have a significant effect were marital status; work; K10; other languages; treated for depression in last month; treated for anxiety in the last month; quality of life; menopause; HRT use.
The study aimed to examine whether an association between depression and anxiety and the onset of incident CVD existed in a large cohort of people free of diagnosed CVD at baseline. A secondary aim was to understand if these relationships differed by type of CVD and sex. The main findings of this study revealed for men having depression was associated with an increased risk of CVD, and this risk remained while adjusting for other covariates. For each of the other CVD subtypes (ACS, AMI, and unstable angina) no effect was reported for either depression, anxiety or comorbid depression and anxiety for men. However, the effect size for men with depression and unstable angina was similar to those reported for depression and CVD, although the CI’s were wide, this may be due to the relatively small number of events reported, making this result inconclusive. For women having depression was associated with an increased risk of CVD that could not be explained by age or any other established risk factors for CHD. No other results for men and women were reported to be similar. In women having comorbid depression and anxiety was associated with an increased risk of CVD, ACS and AMI. Although the HRs reduced in the adjusted models, the relationship between depression, comorbid depression and anxiety and CVDs could not be fully explained by lifestyle, health status, and sociodemographic factors. The effect size for unstable angina was larger than CVD but had wide CI’s, which could be due to the small number of events thus making this result inconclusive. There is no evidence from these results to support the association between anxiety and the onset of any CVD subtypes in either men or women. The null findings for anxiety and all CVD subtypes in both sexes indicate the possibility
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there is no relationship. For each CVD subtype, there were a relatively small number of events and the HRs were smaller compared to depression and comorbid depression and anxiety, indicating there is no relationship between anxiety and CVD.

The increased risk of CVD among women with comorbid anxiety and depression

These results for women are consistent with previous findings that report comorbid anxiety and depression are associated with an increased risk of the onset of incident CHD events in a women only sample (Berecki-Gisolf et al., 2013). To my knowledge, this is the only other study to examine the effects of comorbid anxiety and depression on the onset of CHD in a disease free population at baseline in women. Unlike Berecki-Gisolf et al., (2013), who used self-report measures to establish CHD status, this study was able to explore the association between depression and/or anxiety in subtypes of CVDs using ICD-10-AM codes. For women with unstable angina, an association was found only with depression and anxiety when adjusting for age. In the other models, although the HRs were similar, the CIs were wide, which suggests there was not enough power. The findings presented in this chapter extend further on the findings from Berecki-Gisolf et al., (2013) by also examining men. Men with depression was only associated with an increased risk of CVD and no other CVD subtype. All other findings for men were inconclusive, with no association observed for any CVD subtype between anxiety, and comorbid depression and anxiety. The results of this chapter provide support for the risks associated with depression and anxiety and the onset of CVD differ between men and women.
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The findings from this chapter are consistent with a handful of observational studies that found comorbid anxiety and depression to be associated with an increased risk of CVD events (Frasure-Smith & Lespérance, 2008; Rutledge et al., 2009; Vogelzangs et al., 2010; Watkins et al., 2006). What the results in this chapter add to our understanding is when anxiety and depression are comorbid it increases the effect on coronary outcomes. This effect was previously demonstrated in a CAD population where having comorbid anxiety and depression predicted arrhythmias with the reported effect size being larger than either depression or anxiety alone (Watkins et al., 2006). In a sample of women, comorbid anxiety and depression predicted greater adverse cardiac events at five-year follow-up in participants with myocardial ischemia at baseline (Rutledge et al., 2009). The results in this chapter expand on the current evidence and reiterates the importance of observing the effects of not just depression and anxiety independently but their strength when they are comorbid together.

How are these findings are consistent with previous evidence for depression?

Depression was associated with the onset of incident CVD in both men and women which supports current evidence (Van Der Kooy et al., 2007). However, the results in this chapter did not find depression to be associated with an increased risk for any subtype of CVD (ACS, MI, and unstable angina). This finding is contrary to many cohort studies and meta-analyses where depression was found to be associated with incident CHD (Nicholson et al., 2006; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). There could be a few possible explanations for the results of this study not supporting the current evidence.
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In all previous reviews, the outcome measures have included both fatal and non-fatal cardiac events. In one review, 10 of the 21 studies included only fatal CHD as an outcome (Nicholson et al., 2006). Although it was possible in this study to identify and count participant deaths, it was not feasible to identify the cause of death, therefore, unlike many cohort studies, cardiac deaths were not included as an outcome. The one cohort study that measured both sudden cardiac death and non-fatal MI reported depression to be only a risk for sudden cardiac death, but not non-fatal MI (Luukinen, Laippala, & Huikuri, 2003). This evidence would suggest that depression may have a stronger association with cardiac death than non-fatal cardiac events. When the association was examined separately for men and women, an effect for non-fatal CHD was reported in both sexes, with fatal CHD being associated with men only (Ferketich et al., 2000). This finding supports the need to examine CHD outcomes separately for men and women, but it also indicates the effects of depression reported in other studies could be a result of the outcome measures used for CHD. In Ferketich et al. (2000) non-fatal CHD was not broken down into subtypes. This current study was unable to measure for cardiac death, and this could explain why the findings for depression do not support previous evidence.

It is not just the outcome measure used for CVD that differ between many of the cohort studies included in the reviews but also the range of different samples. For example other studies have examined the risk of incident MI and depression in women with diabetes at baseline (Clouse, 2003). Whereas other studies have measured depression by asking participants if they were depressed (Mallon, Broman, & Hetta, 2002), or participants use of psychotropic drugs (Lapane, Zierler, Lasater, Barbour, & Hume, 1995;
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Penttinen & Valonen, 1996) to examine an association between depression and incident MI. There is a wide variation in the definition used for depression in these studies, which also differ from the definition used in the current study. Using a single sample of participants in this study, it was possible to reduce the associated risks of overestimation commented on by Nicholson et al. (2006) in their review. In this current study all participants had the same measure for each exposure and outcome variable; making it possible to adjust each model with a consistently measured set of potential confounders, stratifying by CVD subtype and sex. Using a large sample, it was possible to address the limitations raised in previous meta-analyses, and the results from this current study only supports an association between depression and CVD onset in both men and women.

How these findings are consistent with previous evidence for anxiety?

The results presented in this chapter find anxiety not to be associated with the onset of any CVD subtype measured by this study in either men or women, which is not consistent with recent evidence (Janszky et al., 2010; Roest, Martens, de Jonge et al., 2010). Unlike depression, the evidence for anxiety is not as consistent. Of the two reviews exploring the increased risk of CVD or CHD, only one study on depression reported null results for either incident CVD or CHD (Nicholson et al., 2006; Van Der Kooy et al., 2007), whereas a review on anxiety reported null findings in 9 out of the 21 studies included. The evidence associating anxiety with the onset of CVD and CHD is inconsistent and the evidence to support an association has been subjected to the same methodological concerns as studies examining depression (Janszky et al., 2010). Similar to findings for depression and CHD risk, a meta-analysis reported anxiety to be a greater
risk for cardiac death than incident CHD (Roest et al., 2010). As no association was observed between anxiety and an increased risk for the onset of any CVD for either men and women, the results from this chapter do not support the overall conclusions drawn from this recent meta-analysis.

Two cohort studies not included in the meta-analysis by Roest et al (2010) and Nabi et al., (2010), included large sample sizes. One study had a sample of 24,128 participants (Nabi et al., 2010) and a second study included a male-only sample of 49,321 participants (Janszky et al., 2010). Nabi et al., (2010) broke down anxiety symptoms into somatic and psychological using a self-report scale. After adjusting for sociodemographic, behavioural and depression variables, the associated risk of CHD remained only for women with somatic symptoms of anxiety. This evidence indicates that certain symptoms of anxiety may have a stronger effect in women and reiterates the need to examine the risk associated with the onset of CHD separately for men and women. It also demonstrates the importance of the type of measurement used for anxiety when exploring risk. Jansky et al., (2010) conducted a large cohort study diagnosing depression and anxiety disorders at baseline in men aged 18-20 years, at follow-up 37 years later only anxiety was reported to be associated with an increased risk of CHD and AMI even after controlling for established cardiac risk factors. This study included a nationwide sample of men screened at baseline for anxiety and depression by self-report measures. Individuals with scores from the self-report measures indicating anxiety and depression were then diagnosed by a psychiatrist. It is possible the results reported in this chapter do not corroborate the findings from Janszky et al. (2010), due to the different measures used for detecting anxiety and depression. Unlike Jansky et al, (2010), this current study presented
in this chapter relied on self-report measures of depression and anxiety, asking participants if they had ever received a diagnosis from a doctor. Using this measure, it is possible not every case of depression and anxiety was detected and therefore depression and anxiety may have been underrepresented. Janszky et al. (2010) results did not support depression as a risk for CHD, the authors concluded this might be due to the length of follow-up ending when most participants would have been in their late 50’s, an age when, for men, the risk of CHD starts to increase. The findings from these two large cohort studies suggest when examining the role of depression and anxiety on the risk of incident CVD and CHD, the importance of the measures used for both exposure and outcome variables. The risks associated with depression and anxiety may be dose dependent for different subtypes of CVD and may differ in men and women.

Follow-up. Although the sample size in the current study was large, the mean follow-up was 2.4 years, which only allowed for a limited number of CVD events to occur. The onset of CVD in the general population in women begins later in life than men, with a sharp increase seen in women aged 65-74 years. The onset of CVD for men starts earlier, with a marked increase between the ages of 45-54 years, which was not the case for men in this sample, with the onset of events occurring much later (AIHW, 2007). In the review by Nicholson et al., (2006) 3.2% of their pooled sample experienced either an AMI event or a CHD death, in this current study, the number of ACS or AMI events was 1.4% and 0.8% for men and 0.5% and 0.2% for women respectively. In other cohort studies finding depression to be a risk, follow-up periods were longer at 8.3 years.
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(Ferketich et al., 2000). In comparison to other cohort studies, this suggests the findings for depression in this study might be due to lack of power, and a shorter follow-up period.

**Sex.** For women, the risk of comorbid anxiety and depression was associated with a greater risk of CVD, ACS, and AMI. This finding supports recent evidence that women’s CHD differs from men’s (Shaw, 2009). The evidence from this current study supports this finding and suggests that differences in certain psychosocial risk factors between CHD in men and women are worthy of future investigations.

**Adjustment for confounders**

As mentioned in the introduction of this chapter, very few studies adjusted for every cardiac risk factor and even fewer adjusted for cardiac risks associated with depression. As not all studies adjusted for the same covariates, it is possible that if they had done so, the overall effects reported would have been weaker. In this study, the effects of depression and CVD in both men and women, and comorbid anxiety and depression for women were found even after adjusting for these confounders. However, the HRs were reduced, which is consistent with Nicolson’s findings (Nicholson et al., 2006). These findings highlight the importance of considering all risks that are involved in the onset of CHD, rather than observing isolated risks, and supports the importance of presenting both adjusted and unadjusted results. It is probably a complex combination of factors that are involved.
Limitations and strengths

A limitation of this current study was the use of self-report measures for both depression and anxiety based on asking participants whether a doctor has diagnosed them with anxiety and/or depression. Asking people to recall whether a doctor has ever told them they have either depression or anxiety may mean this was under-reported by participants in this sample. This question would have also excluded participants with either condition who have not sought advice from a general practitioner, participants who do not acknowledge they have either depression or anxiety and participants who had been diagnosed with depression and anxiety since completing the 45 and Up Survey. Previous evidence found in a sample where 10% of people had depression, anxiety or combination of both, only 3% reported having mental health problems (Eaton et al., 2012). If depression and anxiety were under reported in this sample the effects reported between depression and anxiety and CVDs could be stronger.

Evidence suggests women are twice as likely as men to be diagnosed with depression or an anxiety disorder (Eaton et al., 2012; Seedat et al., 2009). Although men suffer from depression, it tends to be unrecognised and untreated (APA, 2012). The reason suggested for this bias in diagnosis is that men experience and cope with depression differently to women (APA 2012). When reporting depression, men are more likely to report symptoms of fatigue, irritability, and loss of interest, whereas the current criteria used for detecting depression may be more biased toward feelings of sadness and worthlessness which, tend to be more commonly expressed by women with depression. Due to this bias in symptoms reported when using the current criteria, women are therefore more likely to be diagnosed with depression than men (Martin 2013), and this is
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a probable reason for men being underdiagnosed and untreated for depression (Addis, Mansfield, & Syzdek, 2010). Another cause presented in the evidence for the underdiagnosis and treatment of depression and anxiety in men is the fear of being stigmatised by a mental health label that may prevent men seeking help for the symptoms they are experiencing (Magovcevic & Addis, 2005). These factors suggest a possible under-representation of the number of men with depression and/or anxiety in this sample.

The proportion of this sample reporting depression was 6.7% in men and 10.6% in women. In this sample, 2.6% of men and 4.5% of women reported having anxiety. The number of participants in this sample with depression and anxiety is lower than the reported prevalence rates for these conditions in this age group in the general population. The prevalence of all anxiety disorders in the general population of people aged between 45-59 years has been reported to be 30.8% and 15.3% in people above 60 years. Depressive disorders are reported in 22.9% of people aged 45-59 years and 11.9% of people aged over 60 years (Kessler et al., 2005). Although the 45 and Up Study was not designed to produce prevalence estimates, it is important to consider whether the sample is representative of the general population regarding the proportion reported as depressed and anxious, as this provides an indication of the generalisability of the results. In previous studies reporting an association between depression and an increased risk for CHD, the number of participants with depression included in the samples was higher than in the present study. In Ferketich et al. (2000) 17.5% of women in their population had depression; this is much greater than in the 45 and Up Study sample. For participants 45 years and older, the prevalence of a lifetime diagnosis of anxiety in men is 12.5% and
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21.5% in women. For depression, this figure is slightly higher, with 18.0% of men and 27.5% of women having a lifetime diagnosis (Australian Bureau of Statistics, 2008).

There are two likely explanations for the lower proportion of participants in this sample with depression and anxiety compared to other studies and the general population. Firstly, it is possible psychologically healthier members of the population participated in this study, consistent with the healthy cohort effect (Korda et al., 2013; Paradise, Naismith, Davenport, Hickie, & Glozier, 2012). Secondly, the use of self-report doctor diagnosis to measure depression and anxiety does not allow for identification of participants who had not sought the support of a medical practitioner. The study’s cohort appear to be healthier both psychologically and physically. The implications of a healthier cohort means CVD events may be under-represented which could explain why no significant relationship was found for depression and ACS, AMI and unstable angina. The non-depressed and non-anxious groups may possibly have contained people with depression and/or anxiety who could not be identified by the measures this study used for depression and anxiety. This misclassification could have contributed to the biasing of the estimates towards the reporting of null results. Despite the likely healthy cohort effect and the underascertainment of depression and anxiety many statistically significant association were still observed, suggesting the true effects may be stronger.

Finally, it was not possible for this study to understand the extent of reverse causality between depression and anxiety on preclinical cardiac disease in the results that showed an effect in women and men (Frasure-Smith & Lespérance, 2010). This was also raised as a concern in the review by Nicholson et al., (2006). It was only possible to
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determine whether participants had been treated for depression and/or anxiety in the last month and although this was used as a confounding variable in the adjusted regression models, it was not possible to identify participants who were treated earlier than the last month. This represents a limitation that future studies should addressed as it is not known whether treating depression and anxiety would reduce the risk for heart disease.

Despite these limitations, this study has a number of strengths including its large sample and its longitudinal approach. The breadth of the information available allowed for adjustment of a wide range of confounders. The large numbers of participants included in this study made it possible to divide the sample by sex and explore whether the risks are different for men and women with a meaningful sample. Despite the large sample, a limitation was the number of events decreasing when the analyses were stratified therefore reducing the power. The low number of CVD events was partly due to the short follow-up, which did not allow for the accumulation of many CVD events. Compared to other studies that had follow-up periods that were in excess of 10 years (Ford et al., 1998; Janszky et al., 2010) this study had a relatively short follow-up period. With a longer follow-up period, it would be possible to observe more CVD events to ascertain whether the association between depression and anxiety would differ and whether there would be fewer null effects. A recommendation would be to conduct additional analyses on this data with a longer follow-up, to examine the association with anxiety and depression with more events to overcome some of the limitations of this current study.

The participation rate (18%) of the 45 and Up Study is reported to be low, which does raise the issue of generalisability. However, as it is a large cohort study based on a
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population which covers both highly populated areas and remote rural areas, there are claims the study has substantial heterogeneity (Ponsonby, Dwyer, & Couper, 1996). To provide support for the generalisability of findings from the 45 and Up Study, the study has been compared with another population survey including similar variables and a 60% response rate. For some variables, there was a lower prevalence, for example, smoking, however relative risks between smoking and other variables were found to be very similar (Mealing et al., 2010).

A further strength of the current study was the access to hospital admissions data for follow-up, an objective measure not influenced by recall bias or demand characteristics. Administrative coding of hospital admissions data has good validity for CVD outcomes with kappa scores of 0.6-0.8 for agreement between chart reports and recorded diagnosis (Teng, Finn, Hung, Geelhoed, & Hobbs, 2008). As 6.9% for men and 4.6% for women of all CVD, ACS, AMI and unstable angina results in hospitalisation in Australia (National Heart Foundation of Australia, 2014), using APDC to capture the outcome of CVD was not considered a limitation. Using APDC allowed for a clearer and more in-depth exploration of CVD subtypes. Only incident cases of CVD subtypes were investigated with all possible recurrent events being excluded by identifying previous hospital admissions for CVD and participants who had indicated on the survey to having heart disease. Also, excluded were associated diseases such as cancer, as cancer treatment may increase the risk of a cardiac event.
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Clinical implications.

The clinical implications of this study highlight the importance of raising awareness of treating people with depression and anxiety. The evidence from this study supports an association with depression and an increased risk for CVD in both men and women, and an increased risk for CVD, ACS, and AMI in women with comorbid depression and anxiety. It is not clear from the findings of this study or from previous evidence whether treating depression and/or anxiety reduces the associated risks of CVDs. Neither is it clear from the evidence whether the severity or recurrence of symptoms increases the risk. The clinical implications highlight the importance of both identifying and treating people with depression and anxiety. It also supports the benefits of assessing peoples risks for CVDs when being treated for depression and anxiety. It is unclear whether treating anxiety and depression in clinical practice would reduce the risk associated with the onset of CHD. However, the benefits of treating anxiety and depression to improve symptomatic and functional improvement are important for quality of life regardless of whether it reduces the possible risk associated with the onset of CHD.

There are many theories suggesting what the possible mechanisms are between depression, anxiety and heart disease that could increase a person’s risk of heart disease. It was not the scope of this study to determine what those mechanisms may be. However, it would appear from the evidence that there may be a link between whether depression and anxiety have been diagnosed, the severity of symptoms, (Ferketich et al., 2000; Janszky et al., 2010) and the symptoms experienced (Nabi et al., 2010). As Lespérance and Frasure-Smith (2010) pointed out, depression and anxiety are very different from other risk factors for CHD in the way they are defined. People have to experience a range of symptoms that
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vary enormously from person to person. Therefore, when exploring how depression and anxiety may be associated with an increased risk for heart disease, it is not clear if it is a certain combination of symptoms that are associated with an increased risk of CHD or whether certain symptoms have a more potent interaction than others.

Gender role differences may expose women to different psychosocial experiences that are less prevalent in men such as tensions between career and family commitments (Dixon 1997). As women are underrepresented in previous studies, this has important implications for clinical practice, especially as there is evidence that physicians are less likely to diagnose women with heart disease than men, perceiving them to have a lower risk (Mosca et al., 2005). This is relevant for clinical practice as often the somatic symptoms of depression and anxiety can mimic the symptoms of heart disease, e.g., palpitations, shortness of breath, fatigue, loss of energy. Based on the findings from this study, psychological factors, along with established risk factors should be considered when assessing a person’s risk of heart disease, especially for women.

Conclusion

The cardiovascular literature to date has largely examined anxiety and depression separately; these findings support the need for future research to address both anxiety and depression as a combined risk. With its large sample size and its ability to adjust for potential confounders, this study provides strong support for comorbid anxiety and depression being a risk for CVD, ACS, and AMI in women. This study’s findings are not consistent with the current evidence for depression being associated with an increased risk for CHD.
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This study also provides persuasive evidence for examining heart disease for women and men independently, but also a need to observe the effects of depression and anxiety jointly. Only for CVD was depression observed to be a risk for both men and women. The onset of CVDs in this sample could not be explained just by the established risks factors which included lifestyle, health status, and demographic factors. As no effects for anxiety were observed it is possible that depression and anxiety especially when comorbid present more of a risk for a cardiac event.
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Chapter 3 Does cardiac rehabilitation reduce anxiety and depression in patients with Coronary Heart Disease? A systematic review.

Coronary heart disease (CHD) has already been recognised in the previous two chapters as being the leading cause of death and morbidity, creating a huge burden on patients, their families and health care systems. Both behavioural risk factors, such as diet and physical activity, and psychological factors, such as depression and anxiety, are modifiable risks that as seen in Chapter 2 have been linked to the development of CHD and also its progression (Dunn, Stommel, Corser, & Holmes-Rovner, 2009). If treatment programs can address these risk factors, there is potential to reduce the burden associated with CHD.

Cardiac rehabilitation (CR) is the best practice approach used by health services to improve the outcomes of patients who have recently had a cardiac event (National Institute of Health and Care Excellence, 2007). As described in Chapter 1, CR is an evidence-based secondary prevention intervention that aims to reduce future risks to morbidity and mortality through improving patients’ physical, psychological and emotional recovery (Dalal, Evans, & Campbell, 2004). These programs target risk factors through exercise, education, counselling and behavioural change provided by health professionals in either acute or community care settings (Taylor et al., 2010). There is much evidence to support CR as an effective program for reducing morbidity and mortality through improvements in behavioural risk factors (Jolliffe et al., 2001; Taylor et al., 2004). What is less clear, and will inform the question being asked in this review, is the efficacy of CR in reducing patients’ anxiety and depression.
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Studies that have examined the role of anxiety and depression in recovery after a heart attack have found patients with anxiety and/or depression to have a worse prognosis than those without (Frasure-Smith & Lespérance, 2008; Meijer et al., 2011; Nicholson et al., 2006). Between 31% and 45% of patients with CHD have depressive symptoms (Lespérance & Frasure-Smith, 2000; Carney et al. 2009; Thombs et al 2008), and they have been found to have a two to three-fold increased risk of future cardiac events and mortality compared to those without depression (Barth et al., 2004; Bunker et al., 2003; Goldston & Baillie, 2008; van Melle et al., 2004). The prevalence of anxiety disorders in cardiac patients is between 24% and 36% (Bankier, Januzzi, & Littman, 2004; Roest et al., 2010; Todaro, Shen, Raffa, Tilkemeier, & Niaura, 2007). Although the research on the role of anxiety in CHD recovery is not as extensive, a recent study found anxiety that persists for more than three months is predictive of further cardiac events and mortality after controlling for behavioural risk factors and other potential confounders (Moser et al., 2011). It would appear from the evidence cardiac patients are at a greater risk of an adverse outcome, regardless of whether depression and anxiety are measured from self-report symptoms or through diagnostic criteria (Frasure-Smith & Lespérance, 2008; Huffman, Celano, Beach, Motiwala, & Jacuzzi, 2013). However, reducing cardiac patients’ levels of depression and anxiety can reduce mortality, morbidity and improve quality of life (Linden, 2009). It is, therefore, important that services address elevated levels of anxiety and depression symptoms as part of the recovery process.

In recognition of the need to tackle psychological risk factors in cardiac patients, depression and anxiety are increasingly measured as outcomes in trials of CR. Two recent reviews examined the impact of CR interventions on depression. One review concentrated
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on the impact of community-based CR interventions on depression in patients aged over 65. This review found that most community-based CR significantly reduced depression when compared to usual care without CR, with the authors suggesting that tailored interventions including psychosocial interventions appeared to be more effective in reducing depression than a standard CR program (Gellis & Kang-Yi, 2012). A second review examined whether CR or mental health interventions were effective at reducing depression and recurrent cardiac events (Rutledge et al., 2013). Their findings indicate that both CR and mental health interventions have a modest impact on depression symptoms, while CR was more effective at reducing mortality than mental health interventions (Rutledge, Redwine, Linke, & Mills 2013). Neither review examined anxiety. However, the consideration of anxiety as well as depression is important due to the high interrelation of both in a cardiac population (Higgins, Murphy, Nicholas, Worcester, & Lindner, 2007; Huffman et al., 2013). Unlike both of the previous reviews, the current review will synthesise evidence regarding the efficacy of only community-based CR, delivered to patients as part of standard routine health care service, in terms of its impact on both depression and anxiety. To my knowledge, this is the first review to examine the impact of standard routine community-based CR on reducing depression and anxiety. A decision was made to include non-randomised control trials (non-RCT) along with randomised control trials (RCT), to broaden the number of studies included to answer the research aims and to be able to include studies that would have considered randomisation of CR treatment unethical. A systematic review was deemed to be the most appropriate way to evaluate the effectiveness of the different CR interventions included in the review. An improved understanding of these issues will guide the development of future CR
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Interventions which are likely to be successful in improving the psychological outcomes of cardiac patients with elevated levels of anxiety and depression and therefore improving their overall outcomes.

Method

Search strategy. A search of the literature was conducted in July 2014. Studies were identified by searching electronic databases; PsycInfo, PsycArticles, Medline, Health Source and CINAHL. Keywords used for searching the databases included “cardiac rehabilitation”; “cardiopulmonary rehabilitation”; “rehabilitation*”; “rehabilitat*”; “anxiety”; ”depression”; “depressive”; “dysthymia”; “depress*”; “affective disorder”; ”mood”; “distress”. All Medical Subject Heading (MeSH) terms for cardiac rehabilitation, depression and anxiety were used.

The search was limited to studies published from January 2002 until July 2014 so that the evaluation would be restricted to current CR practice. In total 1392 records were found once duplicated papers were excluded. The records were assessed for relevance in a three-phase process (see Figure 1). The process of screening titles and abstracts was carried out by the doctoral candidate Caroline Joyce (CJ). Where eligibility for inclusion was unclear, titles and abstracts were reviewed by the primary supervisor Kathryn Nicholson Perry (KNP). CJ extracted the data from the full text of papers selected for review (N=33) using the agreed upon inclusion criteria and this was then verified by KNP. Fifteen articles were rejected following an assessment of the full text due to the absence of a comparison group, leaving 18 articles to be included. Any disagreements were resolved by discussion between the two reviewers.
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**Figure 2.** Search databases and classification of articles

**Inclusion criteria**

For the purpose of this review, CR was defined as standard hospital/centre-based cardiac rehabilitation provided by hospitals as typical care delivered to patients after discharge from hospital. Core components of standard CR (to be referred to as SCR) included: an exercise component conducted in either a hospital gym or community setting and delivered by a cardiac nurse, physiotherapist or exercise physiologist and an education component delivered by a multidisciplinary team, covering diet, exercise, medications, and social and psychological issues. To meet the inclusion criteria, an SCR program needed to be compared to either an alternative CR intervention (to be referred to as ACR) that focused on the core elements of SCR with additional components not offered as part of SCR; or no CR, where patients were instead offered follow-up appointments with a healthcare professional and provided with heart health information (to be referred to as
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usual care (UC)). Articles needed to be written or translated into English and to have been published in peer-reviewed journals. Participants were of any age and must have experienced an acute coronary syndrome (ACS), an acute myocardial infarction (AMI) or angina, or to have undergone coronary artery bypass grafting (CABG), or percutaneous transluminal coronary angioplasty (PTCA). To be included, articles must have measured either anxiety and/or depression before the cardiac rehabilitation program had begun and at least one follow-up point after the program had been completed.

Rather than restricting the review to RCTs, observational studies were also included, as it was recognised to be an area where RCTs may not always be ethical and sometimes may be impractical. Although RCTs are considered the gold standard of evidence, observational studies evaluating the effectiveness of CR have been found to produce similar results to RCTs, they were also found to be no less valid and not to overestimate the treatment effect (Concato, Shah, & Horwitz, 2000; Kjell & Hartz, 2000).

Exclusion criteria

Articles that reported outcomes for patients who had heart failure, or underwent a heart transplant or defibrillator implant were excluded, as were studies of patients with major psychiatric illness. Exclusion of studies focusing on these conditions was considered appropriate as the treatment and outcomes for these patients differ to patients who had experienced an ACS. Qualitative papers, case studies, and dissertations were excluded from the review.
Data extraction and quality scoring

A data extraction sheet was developed to summarise the information needed for the review. Three reviewers (CJ, KNP, CW) assessed the articles for quality using the PEDro-P scale (Maher, Sherrington, Robert, Moseley, & Elkins, 2003). The scale has sufficient reliability to assess the internal validity (IV) of RCTs and non-RCTs (Murray et al., 2013). The PEDro-P scale was developed from the Delphi consensus scale (Verhagen, de Vet, Bie, & Alphons, 1998) and the Jahad scale (Jadad et al., 1996) to assess methodological quality, and contains 11 criteria regarding blinding of participants, therapists and assessors, statistical reporting and adequacy of follow-up rates. A minimum score of 0 points and a maximum of 10 can be obtained. A maximum score of 8 can be attained for non-RCTs as criterion 2 and 3 are about random allocation and concealment. Classifications of scores were as follows; 9-10 excellent, 6-8 good, 4-5 fair, <4 poor (Foley, Bhogal, Teasell, Bureau, & Speechley, 2006).

The modified Sackett scale was used to determine the strength of evidence arising from each study. The scale contains five levels of evidence as seen in Table 5.
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Table 5

Levels of evidence modified from Sackett scale

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>RCTs with a PEDro-P score of 6 or more</td>
</tr>
<tr>
<td>Level 2</td>
<td>RCTs with a PEDro-P score below 6</td>
</tr>
<tr>
<td>Level 3</td>
<td>case-control studies</td>
</tr>
<tr>
<td>Level 4</td>
<td>pre/post studies, post-test and case series</td>
</tr>
<tr>
<td>Level 5</td>
<td>case reports, clinical consensus or observational studies</td>
</tr>
</tbody>
</table>

(Straus, Richardson, Glasziou, & Haynes, 2005).

Assessment of effectiveness

Given a large amount of variation between studies in the content included, the CR program evaluated, the target population, the study design, the length of follow-up and the scales with which outcomes were measured; a meta-analysis or pooling of outcome data was considered inappropriate. Instead, the effectiveness data were synthesised narratively with consideration given to differences between studies and less weight placed on the findings of those evaluations deemed to be of inadequate methodological quality.

Results

Samples and eligibility

In total, this review included 18 studies (overview of papers can be found in Table 7), of which 10 were RCTs. Five studies were carried out in the UK, four in the USA, two in Canada, two in Eire, and a study from each of Japan, Austria, Sweden, Portugal and Denmark.
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For 16 studies the eligibility criteria were clearly specified. All studies included patients with acute myocardial infarctions (AMI) and the majority of studies included patients who had undergone percutaneous coronary intervention (PCI), percutaneous transluminal coronary angioplasty (PTCA) and coronary artery bypass graft (CABG) (n = 10). Some studies also included participants with angina (n = 2), heart failure (n = 3), acute coronary syndrome (ACS; n = 2) and coronary heart disease (CHD; n = 1). Two studies included female only samples (Beckie, Beckstead, Schocken, Evans, & Fletcher, 2011; Grace, Grewal, Arthur, Abramson, & Stewart, 2008), two male only (Hamm et al., 2004; Seki et al., 2003) and one study did not state the breakdown of participants by gender (Jones et al., 2006). One study recruited only participants over the age of 65; this was the only study that included age as a selection criterion.

Quality of the studies

Overall the quality of the 18 studies included in the review was rated as poor on the PEDro-P, with many papers not including sufficient detail about their research design to assess the risk of bias (see Table 6). The quality scores ranged from 0 to 8, with RCTs achieving higher scores as expected. No studies included in this review reached a score in the excellent range. Seven RCTs, out of a total of ten, were rated as good, achieving a score between 6 and 8 (Beckie et al., 2011; Hevey et al., 2003; Jolly et al., 2009; Karlsson et al., 2007; Reid et al., 2005; Seki et al., 2003; Zwisler et al., 2008). The remaining three RCTs were rated as poor with scores between 4 and 5 (Bettencourt et al., 2005; Dalal et al., 2007; Hamm et al., 2004). Only one non-randomised study had a score of 4 (Benzer et al., 2007), with all others scoring below that (Adams et al., 2007; Aldana et al., 2006;
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Arnold, Sewell, & Singh, 2007; Grace et al., 2008; Hevey, McGee, & Horgan, 2007; Jones et al., 2006; Lacey, Musgrave, Freeman, Tod, & Scott, 2004). For strength of evidence, scores ranged from 0-2, with 14 studies scoring 2. An RCT (Bettencourt et al., 2005) and 1 non-RCT (Lacey et al., 2004) for level of evidence scored 0, indicating the statistical reporting in the studies was poor. Using the modified Sackett scale, seven RCTs were rated as Level 1 evidence, suggesting that IV was high (Beckie et al., 2011; Hevey et al., 2003; Jolly et al., 2009; Karlsson et al., 2007; Reid et al., 2005; Seki et al., 2003; Zwisler et al., 2008). All other RCTs were rated as Level 2 evidence (Bettencourt et al., 2005; Dalal et al., 2007; Hamm et al., 2004). All non-RCTs were rated as either Level 4 or Level 5 evidence (Adams et al., 2007; Aldana et al., 2006; Arnold et al., 2007; Benzer et al., 2007; Grace et al., 2008; Hevey et al., 2007; Jones et al., 2006; Lacey et al., 2004).

Two RCTs included in this review based on their score from the PEDro-P were considered to be methodologically rigorous (Bettencourt et al., 2005; Seki et al., 2003), however if they had been assessed for the outcomes under study in this review, for example, depression and anxiety, rather than the outcome they nominated as primary, their scores would have been lower.

There was a number of commonly occurring sources of potential bias. No study blinded participants or therapists, and only one study blinded the assessor (Jolly et al., 2009). As cardiac rehabilitation is a widely used program delivered by a multi-disciplinary team, it would be difficult to blind either the therapists or the patient. While all RCTs reported that CR groups were similar on key characteristics at baseline, four non-RCTs had groups that were not similar at baseline (Arnold et al., 2007; Benzer et al., 2007; Grace et al., 2008; Jones et al., 2006) and only one controlled for these between-
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group differences in the analyses (Benzer et al., 2007). Three RCTs concealed allocation and analysed the main outcomes on an intention-to-treat basis (Beckie et al., 2011; Jolly et al., 2003; Seki et al., 2003). Only one RCT did not analyse the data on an intention-to-treat basis (Karlsson et al., 2007) and allocation concealment was not used in five studies (Bettencourt et al., 2005; Dalal et al., 2007; Hamm et al., 2004; Hevey et al., 2003; Karlsson et al., 2007). None of the non-RCTs were able to conceal allocation, and only two analysed the data on an intention-to-treat basis (Benzer et al., 2007; Grace et al., 2008). As one study had both a randomised arm to their trial as well as a preference arm, the study was scored on the basis of the randomised arm (Dalal et al., 2007). Two non-RCTs and two RCTs failed to report eligibility criteria, leaving the generalisability of the results to general cardiac patients unknown.
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#### Table 6

Quality of studies reviewed

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Eligibility criteria</th>
<th>Random allocation</th>
<th>Allocation concealed</th>
<th>Groups similar at baseline</th>
<th>Blinding of all participants</th>
<th>Blinding of all therapists</th>
<th>Blinding of all assessors</th>
<th>Outcome obtained from more than 85% of baseline sample?</th>
<th>Intention to treat analysis</th>
<th>Statistical comparisons are reported for at least 1 key outcome</th>
<th>Both point measures and measures of variability provided for at least 1 key outcome</th>
<th>Internal validity</th>
<th>Strength of evidence</th>
</tr>
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<tbody>
<tr>
<td>Beckie et al., 2011</td>
<td>RCT</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>Dalal et al., 2007</td>
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<td>Yes</td>
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<td>No</td>
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<td>Hevey et al., 2003</td>
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<td>No</td>
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<td>Non-RCT (Retrospective cohort study)</td>
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<td>Grace, Grewal, Arthur, Abramson, &amp; Stewart, 2008</td>
<td>Non-RCT (Prospective controlled quasi experimental)</td>
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<td>Jones et al., 2006</td>
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<td>Lacey, Musgrave, Freeman, Tod, &amp; Scott, 2004</td>
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Study characteristics

**Intervention.** Due to the inclusion criteria of this review, all studies included an SCR compared with at least one other condition: usual care (UC) in five studies and alternative versions of CR (ACR) in thirteen. SCR programs were offered by health services to cardiac patients after discharge from hospital. SCR programs varied in content and structure, not just between countries, but between different providers within the same country. ACR interventions involved all core elements of CR but differed from SCR programs in a number of respects: duration of intervention, the number of sessions and content. ACR programs included lifestyle workshops, behavioural change intervention, stress management and a program for women only. In the UC condition, the participants did not attend any CR sessions.

**Follow-up measurement.** The majority of studies measured the depression and anxiety outcomes at two-time points, with a baseline measure taken before CR began in all cases. The duration of follow-up ranged from immediately following completion of the CR intervention to 2 years post CR intervention, with the median follow-up period being nine months. Five studies included a second follow-up, with the first follow-up ranging from immediately to 3 months post CR and the second ranging from 6 months to 2 years post CR.

**Measurement of depression and anxiety.** All 18 studies measured depression and 14 measured anxiety before and after CR. No studies used either depression or anxiety as an enrolment criterion.
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The majority of studies used the Hospital Anxiety and Depression Scales (HADS; Zigmond & Snaith, 1983; n=11) to measure anxiety and depression symptoms. Other scales used to measure depression were: Beck Depression Inventory (BDI; Beck, Steer, & Carbin, 1988; n=3), Centre for Epidemiology Studies - Depression (CES-D; Radloff, 1977; n=3), and the Self-Rating Depression Scale (Zung, 1965; n=1). Measures of anxiety were: Brief Symptom Inventory (Derogatis, 1993; n=2) and the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, 1970; n=1). These scales are all self-report rating scales that have been found to be acceptable for screening and measuring depression and anxiety symptomatology.
## ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

### Table 7

Summary of RCT & observational studies reviewed

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Country</th>
<th>Follow-up</th>
<th>Sample population</th>
<th>CR Intervention Sample Content</th>
<th>Alternative CR Sample Duration Content</th>
<th>Control Sample</th>
<th>Outcome for depression Measure Primary Findings</th>
<th>Outcome for anxiety Measure Primary Findings</th>
<th>Mild/Moderate/Clinical depression and/or anxiety measured at baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams et al., 2007, USA</td>
<td>T1 Baseline T2 1 year</td>
<td>N=217 M 77%, F 23% 63 yrs CABG, AMI, transcatheter procedures</td>
<td>SCR N=78 3 sessions a week 12 weeks Exercise sessions, dietician and social worker.</td>
<td>ACR N=25 Leap for Life 8-hour workshop and workbook. Workshop taught by nurse, exercise specialist, dietician and social worker.</td>
<td>UC N=114</td>
<td>BDI, BSI Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
<td></td>
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<tr>
<td>Aldana et al., 2006, USA</td>
<td>T1 Baseline T2 3 months T3 6 months</td>
<td>N=141 M 82%, F 18% 58yrs AMI, PTCA, CABG (ACR group had to pay a fee to attend course, may bias results)</td>
<td>SCR N=28 1-3 months. 3 sessions a week 12 weeks Exercise and information sessions</td>
<td>ACR N=28 Ornish lifestyle modification program. Completed in 3 stages over a year. Stress management, group support, exercise and diet.</td>
<td>UC N=28</td>
<td>CES-D ACR significantly lower than UC p&lt;.05</td>
<td>ACR significantly lower than the SCR and UC p&lt;.05</td>
<td>Scores in normal range</td>
<td></td>
</tr>
<tr>
<td>Arnold et al., 2007, UK</td>
<td>T1 Baseline T2 post CR</td>
<td>N=206 M 77%, F 23% 61 yrs AMI</td>
<td>SCR N=85 Once a week 6 weeks Circuit training</td>
<td>ACR N=121 Twice a week 6 weeks Circuit training and Walking</td>
<td></td>
<td>HADS Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
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</table>
### ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Country</th>
<th>Follow-up</th>
<th>Sample population</th>
<th>CR Intervention</th>
<th>Alternative CR</th>
<th>Control</th>
<th>Outcome for depression</th>
<th>Outcome for anxiety</th>
<th>Mild/Moderate/Clinical depression and/or anxiety measured at baseline</th>
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</thead>
<tbody>
<tr>
<td>Beckie et al., 2011, USA</td>
<td>T1 Baseline T2 post CR T3 6mth</td>
<td>N=252 F 100% 63 yrs PCI, CABG, angina, AMI</td>
<td>SCR N=99 12 weeks 3 days a week of exercise training and 1 a week educational session.</td>
<td>ACR N=141 12 weeks women only 3 days a week exercise training Multi behavioural change intervention to assess readiness to change diet, activity levels and manage stress followed by 3 x 60-minute individual psychotherapeutic sessions. Psychoeducational sessions once a week for 10 weeks</td>
<td>CES-D</td>
<td>Not measured</td>
<td>Scores in normal range</td>
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<tr>
<td>Bettencourt et., 2005, Portugal</td>
<td>T1 Baseline T2 1 year</td>
<td>N=126 M=83.5%, F=16.5% 57yrs ACS</td>
<td>SCR N=31 12 weeks 3 60 minute exercise sessions a week for 12 weeks Then 1 session a month for rest of the year</td>
<td>UC N=95 On average 3.5 follow-ups a year</td>
<td>BDI</td>
<td>Did not measure between group differences</td>
<td>Not measured</td>
<td>Prevalence of depressive symptoms lower (NS) SCR BDI&gt;9(%) 42-38 BDI&gt;19(%) 10-3 UC BDI&gt;9(%) 40-56 BDI&gt;19(%) 12-12</td>
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</table>
## ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Country</th>
<th>Follow-up</th>
<th>Sample population</th>
<th>CR Intervention</th>
<th>Alternative CR</th>
<th>Control</th>
<th>Outcome for depression</th>
<th>Outcome for anxiety</th>
<th>Mild/Moderate/Clinical depression and/or anxiety measured at baseline</th>
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</thead>
<tbody>
<tr>
<td>Benzer et al., 2007, Austrian</td>
<td>T1 Baseline</td>
<td>T2 1 months</td>
<td>T3 3 months</td>
<td>SCR</td>
<td>ACR</td>
<td>UC, N=67</td>
<td>HADS Depression</td>
<td>HADS Anxiety</td>
<td>Scores in normal range</td>
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<td></td>
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<td></td>
<td>N= 216</td>
<td>M=87</td>
<td>N=63</td>
<td>N=67</td>
<td>Significantly lower at 3 months in ACR than UC.</td>
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<td></td>
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<td></td>
<td>M 61%, F 29%</td>
<td>3 months</td>
<td>4 weeks</td>
<td>Follow-up care by hospital – no more information supplied</td>
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<td></td>
<td></td>
<td></td>
<td>56 yrs</td>
<td>2 exercise sessions a week</td>
<td>5 exercise training sessions a week</td>
<td>Plus psychosocial intervention including counselling, relaxation techniques, stress management, vocational guidance, patient education for lifestyle modification</td>
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<td></td>
<td></td>
<td></td>
<td>AML, PCI, CABG, valve replacement, heart failure</td>
<td>Vocational counselling to start lifestyle modification</td>
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<tr>
<td>Dalal et al., 2007, UK</td>
<td>T1 Baseline</td>
<td>T2 9 months</td>
<td>N=230</td>
<td>SCR Randomised</td>
<td>ACR Randomised</td>
<td>SCR Pref hosp N=47</td>
<td>HADS Depression</td>
<td>HADS Anxiety</td>
<td>Scores in normal range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M=80%, F=20%</td>
<td>N=32</td>
<td>N=40</td>
<td>N=47</td>
<td>No significant between-group differences</td>
<td>No significant between-group differences</td>
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<tr>
<td></td>
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<td></td>
<td>63 yrs</td>
<td>2 hour class once a week for 8-10 weeks</td>
<td>4 weeks</td>
<td>Given Heart Manual to use over to over 6 weeks, Heart Manual comprehensive step by step guide to CR covering exercise, stress management and education.  First week post discharge home visit from CR nurse, Telephone follow-up calls made over a 6 week period.</td>
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<td></td>
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<td>AMI</td>
<td>Session ran by CR nurse, exercise therapist or physiotherapist, with input from a psychologist, occupational therapist, pharmacist and dietician</td>
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<tr>
<td>Grace et al., 2008, Canada</td>
<td>T1 Baseline</td>
<td>T2 18 months</td>
<td>N=157</td>
<td>SCR</td>
<td>UC</td>
<td>UC</td>
<td>HADS Depression</td>
<td>HADS Anxiety</td>
<td>Scores in normal range</td>
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<tr>
<td></td>
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<td></td>
<td>F=100%</td>
<td>N=65</td>
<td>N=65</td>
<td>N=65</td>
<td>No significant between-group differences</td>
<td>No significant between-group differences</td>
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<tr>
<td></td>
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<td></td>
<td>65 yrs</td>
<td>2 exercise sessions a week at a CR centre</td>
<td>Did not attend CR</td>
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<td>ACS, PCI, CABG or revascularisation</td>
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<tr>
<td>Author (year)</td>
<td>Country</td>
<td>Follow-up</td>
<td>Sample population</td>
<td>N</td>
<td>Gender</td>
<td>Mean age</td>
<td>CHD conditions</td>
<td>CR Intervention</td>
<td>Alternative CR</td>
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<tr>
<td>Hamm et al., 2004, USA</td>
<td></td>
<td>T1 Baseline</td>
<td>N=623</td>
<td>M=100%</td>
<td>60 yrs</td>
<td>CHD referred to CR</td>
<td>SCR N=309</td>
<td>52 weeks, 1 session per week</td>
<td>ACR N=314</td>
</tr>
<tr>
<td>Hevey et al., 2007, Eire Sent email to authors to get mean scores</td>
<td></td>
<td>T1 Baseline</td>
<td>N=316</td>
<td>M=78%, F=22%</td>
<td>62 yrs</td>
<td>AMI, CABG, PTCA</td>
<td>SCR N=131</td>
<td>10 weeks</td>
<td>3 x 50 min exercise sessions a week, also received advice on diet, pharmacology and cardiac education. 8 x1hr group-based cognitive behavioural stress management intervention.</td>
</tr>
<tr>
<td>Hevey et al., 2003, Eire</td>
<td></td>
<td>T1 Baseline</td>
<td>N=60</td>
<td>M=78%, F=22%</td>
<td>60 yrs</td>
<td>AMI, CABG, PTCA, and other conditions</td>
<td>SCR N=30</td>
<td>10 week CR</td>
<td>3 x exercise sessions a week (30 in total). Also received advice on diet, pharmacology and cardiac education.</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Country</td>
<td>Follow-up</td>
<td>Sample population</td>
<td>CR Intervention</td>
<td>Alternative CR</td>
<td>Control</td>
<td>Outcome for depression</td>
<td>Outcome for anxiety</td>
<td>Mild/Moderate/Clinical depression and/or anxiety measured at baseline</td>
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<tr>
<td>Jolly et al., 2009, UK</td>
<td>T1 baseline</td>
<td>N=525</td>
<td>SCR N=262</td>
<td>ACR N=203</td>
<td>HADS Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
<td></td>
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<tr>
<td></td>
<td>T2 12 mths</td>
<td>M=77%, F=23%</td>
<td>8 -12 weeks</td>
<td>The Heart Manual</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
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<td></td>
<td></td>
<td>61 yrs</td>
<td>12 sessions over 8 weeks</td>
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<td></td>
<td></td>
<td>AML, PTCA, CABG</td>
<td>24 sessions over 12 weeks</td>
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<td></td>
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<td>Included exercise, relaxation, education, and lifestyle.</td>
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<td>N=55</td>
<td>SCR N=12 (pats who completed)</td>
<td>ACR N=5 (Pats who completed)</td>
<td>HADS Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
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<td></td>
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<td>(pats=30, relatives=25)</td>
<td>12 2hr sessions</td>
<td>same as standard</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
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<td></td>
<td></td>
<td>Age and gender not available. AML, CABG</td>
<td>1 hr exercise and 1-hour cardiac education, stress management diet.</td>
<td>In addition the relatives received 2 psychoeducation sessions</td>
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<tr>
<td>Jones et al., 2006, UK</td>
<td>T1 Baseline</td>
<td>N=224</td>
<td>SCR N=113</td>
<td>ACR N=111</td>
<td>HADS Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
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<td></td>
<td>T2 6 weeks</td>
<td>M=77%, F=23%</td>
<td>3 months</td>
<td>stress management program</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
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<td></td>
<td></td>
<td>63 yrs</td>
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<td>AML, CABG</td>
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<tr>
<td>Karlsson et al., 2007, Sweden</td>
<td>T1 Baseline</td>
<td>N=152</td>
<td>SCR N=91</td>
<td>ACR N=61</td>
<td>HADS Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
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<td></td>
<td>T2 12 months</td>
<td>M=66%, F=34%</td>
<td>67 yrs</td>
<td>CR plus heart manual</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
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<td></td>
<td></td>
<td>AML</td>
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<tr>
<td>Lacey et al., 2004, UK</td>
<td>T1 Baseline</td>
<td>N=392</td>
<td>SCR N=196</td>
<td>ACR N=196</td>
<td>HADS Depression</td>
<td>No significant between-group differences</td>
<td>Scores in normal range</td>
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<tr>
<td></td>
<td>T2 12 months</td>
<td>M=85%, F=15%</td>
<td>58 yrs</td>
<td>Distributed CR</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
<td>SCR varied with hospital</td>
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<td></td>
<td></td>
<td>AML, PCI, CABG, Angina, HF</td>
<td>33 sessions</td>
<td>12mths</td>
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<td>T3 24 months</td>
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<td>Reid et al., 2005, Canada</td>
<td>T1 Baseline</td>
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<td>Author (year) Country</td>
<td>Follow-up</td>
<td>Sample population</td>
<td>CR Intervention</td>
<td>Alternative CR</td>
<td>Control</td>
<td>Outcome for depression</td>
<td>Outcome for anxiety</td>
<td>Mild/Moderate/Clinical depression and/or anxiety measured at baseline</td>
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<tr>
<td>Seki et al., 2003, Japan</td>
<td>T1 Baseline T2 6months</td>
<td>N=38 All men 70 yrs (elderly patients) AML, CABG, PCI, ACS</td>
<td>SCR N=20 1 session a week 16 months</td>
<td>UC</td>
<td>Zungs self-rating</td>
<td>STAI State/Trait</td>
<td>Scores in normal range</td>
<td></td>
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<tr>
<td>Zwisler et al., 2008, Denmark (One of 2 papers on the trial)</td>
<td>T1 Baseline T2 12 months</td>
<td>N=770 M=64%, F=36% 66 yrs AML, angina, PCI, CABG, CHF,</td>
<td>SCR N=380 6 week program</td>
<td>UC N=390</td>
<td>HADS Depression</td>
<td>HADS Anxiety</td>
<td>Scores in normal range</td>
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</table>

*The Ornish Lifestyle Modification program was a fee paying intervention that in nearly all cases would not have been covered by health insurance.*

Key for result table: ACR = Cardiac rehabilitation intervention, ACS – Acute Coronary Syndrome, AMI – Acute Myocardial Infarction, BDI = Becks Depression Inventory, BSI A = Brief Symptom Inventory Anxiety Subscale, BSI-D = Brief Symptom Inventory Depression, CABG – coronary artery bypass graft, CDS = Hare-Davis Cardiac Depression Scale, CES-D = Centre for Epidemiology Studies Depression Inventory, DASS 21 = Depression, Anxiety, Stress scales (short form), CHD = coronary heart disease, CR = cardiac rehabilitation, F = female, HADS = Hospital Anxiety and Depression Scale, M = male, mths = months, NS – not significant, PCI – Percutaneous coronary intervention, PTCA = percutaneous angioplasty procedure, RCT = randomised controlled trial, SCL-90-R = Symptom Checklist-90-revised, SCR Standard Cardiac Rehabilitation = standard hospital/community based programme, STAI = State-Trait Anxiety Inventory, T = time, TC - Traditional care = discharge from hospital with follow-up outpatient appointments, TCR – Tailored Cardiac Rehabilitation, UC – Usual Care, yrs = years.
Are CR interventions effective at reducing depression?

Eighteen studies examined the impact of CR interventions on depression, of which 10 compared the effect of SCR to that of ACR, five compared SCR to UC, and three compared SCR to both ACR and UC. The majority of studies only had one follow-up point, but five studies had a second follow-up (Aldana et al., 2006; Beckie et al., 2011; Benzer et al., 2007; Hevey et al., 2003; Reid et al., 2005). Two of the eighteen studies did not report between-group differences in the outcomes of depression or anxiety, only within-group pre and post scores were reported (Bettencourt et al., 2005; Seki et al., 2003). For this reason, these studies have been excluded from the following discussion of CR effectiveness with respect to depression and anxiety.

Depression after SCR relative to UC

Of the five studies comparing SCR to UC, none reported a significant difference between groups at follow-up for depression (Adams et al., 2007; Aldana et al., 2006; Benzer et al., 2007; Grace et al., 2008; Hevey et al., 2007; Zwisler et al., 2008). The strength of evidence for these studies was generally poor. Only one study was rated as Level 1 evidence with an IV score of 4 (Zwisler et al., 2008). The other five studies were all rated as Level 2 evidence, none were RCTs, and four had an IV score of 1 (Adams et al., 2007; Aldana et al., 2006; Grace et al., 2008; Hevey et al., 2007), and one scored 2 (Benzer et al., 2007).

Depression after ACR compared with SCR and UC

ACR was compared to SCR in thirteen studies, three of these studies also included UC as a third comparison group (Adams et al., 2007; Aldana et al., 2006; Benzer et al., 2007). Of these thirteen studies, eight studies did not report a significant
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE
difference between groups. Of these eight studies, three were rated as Level 1 evidence.
These included SCR compared to home CR, evaluated with an IV score of 6 (Jolly et al.,
2009), an SCR intervention spread over a 12 month period, with IV score of 5 (Reid et
al., 2005) and expanded CR, involving a 5 day stay in a patient hotel and a stress
management program in addition to SCR, evaluated with an IV score of 4 (Karlsson et
al., 2007). The remaining five studies were all Level 2 evidence; two were RCTs both
with an IV score of 3. The ACR in one of these studies was SCR delivered over a 52
week period (50 sessions) compared with CR delivered over 26 weeks, after which
participants received one follow-up session a month for a further 26 weeks (32 sessions)
(Hamm et al., 2004). The other ACR was home-CR (Dalal et al., 2007). Of the three
remaining Level 2 evidence studies, one had an IV score of 1, and compared SCR to a
free eight-hour workshop, one compared SCR to ACR, which was SCR plus
psychoeducation sessions for participants’ relatives, with an IV score of 0 (Jones et al.,
2006), and the other SCR was delivered once a week, compared to SCR delivered twice a
week, also with an IV score of 0 (Arnold et al., 2007).

In three studies ACR outperformed SCR in terms of depression at follow-up
(Beckie et al., 2011; Hevey et al., 2003; Lacey et al., 2004). Two of these three studies
collected follow-up data at two separate points (Beckie et al., 2011; Hevey et al., 2003),
only one of these studies saw a lower depression score at the final follow-up (Beckie et
al., 2011). Specifically, a CR intervention tailored to women only (ACR), rated as Level
1 evidence, with an IV score of 6, was associated with a significantly greater increase in
depression symptoms at the six months follow-up compared to mixed gender SCR
(Beckie et al., 2011). In a study rated as Level 2 evidence and with an IV score of 1,
patients in ACR attended SCR but also received a copy of the Heart Manual, and a
significant increase in depression scores was reported compared to the SCR group (Lacey
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et al., 2004). When four week ACR was compared with ten week SCR, in a study rated as Level 1 evidence and with an IV score of 4, the patients in the SCR group had higher levels of depression than the ACR group at post-CR (Hevey et al., 2003). However, at six-month follow-up, there was no significant difference between the two groups.

In two studies with a UC comparison group, ACR outperformed UC in lowering depression symptoms. Both studies were rated as Level 2 evidence with one study having an IV score of 1 (Aldana et al., 2006) and the other a score of 2 (Benzer et al., 2007). A group receiving the Ornish Lifestyle modification program (ACR) saw a significantly lower depression score compared to UC at six-month follow-up with no significant differences between SCR and UC (Aldana et al., 2006). The second study examined a four-week inpatient CR (ACR) relative to SCR and UC (Benzer et al., 2007), depression symptoms were significantly lower in the ACR than in UC at both post-CR follow-up and three month follow-up (Benzer et al., 2007)

Are CR interventions effective at reducing anxiety?

14 studies measured anxiety. The effect of SCR upon anxiety was compared to ACR in seven studies, and UC in four studies, and both ACR and UC in three studies.

Anxiety after SCR interventions compared to UC

Six studies compared SCR to UC, with IV scores of 4 (Zwisler et al., 2008), 2 (Benzer et al., 2007) and 1 (Adams et al., 2007; Aldana et al., 2006; Grace et al., 2008; Hevey et al., 2007). As these are the same studies in which SCR was compared to UC in relation to depression, please see the section titled ‘Depression after SCR relative to UC’ for more detail regarding the intervention and the methodological quality of these studies. No study reported a significant difference between groups at follow-up in terms of anxiety.
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Anxiety after ACR compared to SCR and UC

ACR was compared to SCR in 10 studies, three of these studies also included UC as a third comparison group (Adams et al., 2007; Aldana et al., 2006; Benzer et al., 2007). Of these ten studies, eight studies reported no significant difference between groups. Three of these studies were rated as Level 1 evidence. One had an IV score of 6 and compared SCR to home delivered CR (Jolly et al., 2007). The other two scored 4 and compared SCR to expanded CR, involving a five-day stay in a patient hotel and a stress management program in addition to SCR (Karlsson et al., 2007) and a four-week SCR with ten week SCR (Hevey et al., 2003). The five other studies were all Level 2 evidence. Only one was an RCT, with an IV score of 3 and compared SCR with home-CR (Dalal et al., 2007). One had an IV score of 2 and compared 4-week inpatient CR (ACR) to SCR and UC (Benzer et al., 2007). Another had an IV score of 1 and compared SCR to an 8-hour workshop (Adams et al., 2007). Two studies had IV scores of 0. One compared SCR to ACR where patients’ relatives received a psychological intervention (Jones et al., 2006) and SCR delivered twice a week compared to once a week (Arnold et al., 2007).

Of the three studies that included a UC group, two of these studies found that ACR was associated with a significantly lower anxiety compared to SCR and UC (when this comparison group was included) (Aldana et al., 2006; Lacey et al., 2004). Both studies were rated as Level 2 evidence and received a score of 1 for IV.

Participants who received a copy of the Heart Manual and attended a SCR program reported anxiety symptoms to be significantly lower compared to participants receiving just SCR (Lacey et al., 2004), as did participants receiving the Ornish lifestyle modification program relative to participants receiving SCR or UC (Aldana et al., 2006).
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Effect of CR on patients with elevated levels of depression and anxiety

Of the 18 papers included in this review, only three studies, all Level 2 rated, reported outcomes for participants who met the criteria for clinical depression or anxiety. Only one of these studies was an RCT with an IV score of 4 (Bettencourt et al., 2005), both the other non-RCTs had an IV score of 1 (Hevey et al., 2007; Lacey et al., 2004).

Two of these studies compared SCR to UC (Bettencourt et al., 2005; Hevey et al., 2007) and one compared SCR to ACR (Lacey et al., 2004). All three studies reported within-group differences for participants with elevated levels of anxiety and depression, with no between-group comparisons reported. To understand whether SCR is an effective intervention it is important to conduct between-group comparisons, as natural declines in anxiety and depression symptoms can occur over time, and should not be attributed to the intervention. The findings that follow should, therefore, be interpreted with caution.

While two studies found a reduction in symptoms due to participating in CR among those with elevated levels of anxiety and/or depression (Hevey et al., 2007; Lacey et al., 2004), the other study did not (Bettencourt et al., 2005). Hevey et al. (2007) found that participants with elevated levels of depression, anxiety or both (high distress), all reported a significant reduction in both depression and anxiety over time whether in SCR or UC. In their study examining the effect of SCR and ACR (where participants received SCR and a copy of the Heart Manual (NHS Lothian, 2002), Lacey et al. (2004) found a significant reduction in anxiety in both interventions among those with elevated levels of anxiety at baseline, whereas for participants with elevated levels of depression at baseline, a significant reduction in depression was only observed in ACR. Bettencourt et al. (2005) reported no differences between the proportion of participants with moderate to severe depression at either baseline or one-year follow-up in either the SCR or UC; it was
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noted that only in the SCR group was there a reduction between the two time points in the proportion falling into this category.

Among the remaining 15 studies, all but one were based on samples with mean scores for depression and anxiety falling within the normal range both at baseline and follow-up. However, the standard deviations for these samples indicate that some participants would fall within the range for borderline and clinical depression and/or anxiety. In one study, rated Level 1 evidence and IV score of 4, the mean scores for the SCR group and the UC group were within the range indicating borderline depression at both baseline and follow-up, with neither group displaying a significant reduction in depression following the intervention (Zwisler et al., 2008).

Discussion

Is CR effective at reducing depression and anxiety?

As this review found consistent results for depression and anxiety, they will be discussed together. None of the eight studies evaluating SCR relative to UC found a significant between-group difference in terms of depression or anxiety. Although the extent to which each of these findings are trustworthy is unclear (as all studies were evaluated as being of poor methodological quality (IV scores ranged from 1 to 5)), it is unlikely that CR is effective at reducing either depression or anxiety, given that eight different studies, all with different limitations, point to the same conclusion.

In contrast, two out of three studies demonstrated ACR interventions were more effective than UC, one at reducing both anxiety and depression (Aldana et al., 2006), and one at reducing depression only (Benzer et al., 2007). In both studies, the ACR
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intervention offered a broad range of support for the cardiac patient focusing on lifestyle modification, exercise and stress management, suggesting that CR programs including a wider range of components may be more successful at reducing depression and anxiety than SCR. It should be noted, however, that these studies scored poorly on methodological quality, with IV scores of 1 (Aldana et al., 2006) and 2 (Benzer et al., 2007). The study which found no significant difference between ACR and UC was also of poor methodological quality, achieving an IV score of 1 (Adams et al., 2007).

A further two studies found ACR to be more effective at reducing depression than SCR (Beckie et al., 2011; Lacey et al., 2004). One study was a high-quality RCT (IV 6, Level 1 evidence); the effective CR intervention was offered to women only and differed from SCR by including motivational interviewing (Beckie et al., 2011). A non-RCT (IV score of 1) found an ACR, where participants received SCR plus provision of the Heart Manual (a home-base support management program booklet), outperformed SCR in lowering both depression and anxiety (Lacey et al., 2004). In contrast, two other RCTs found no support for the effectiveness of the Heart Manual when combined with home-based CR compared to SCR in reducing either depression or anxiety (Dalal et al., 2007; IV=3; Jolly et al., 2009; IV=6). Given the inconsistency in study findings and the methodological weaknesses of the studies from which these findings arise, it is unclear whether ACR is effective at reducing depression and anxiety, but the evidence presented in this review does suggest there would be a benefit in further exploring the impact of these additional CR components. In particular, components with a psychological focus, such as motivational interviewing or stress management and the Heart Manual, appear to be promising avenues to examine in terms of reducing depression and anxiety.
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A recent meta-analysis concluded that both CR and mental health interventions had a small to moderate effect on reducing depression and recurrent cardiac events, while only CR was effective at reducing mortality (Rutledge et al., 2013). In contrast, a second meta-analysis reported community CR interventions, especially home-based interventions, reduced depression in elderly cardiac patients and patients with heart failure (Gellis & Kang-Yi, 2012). The authors attributed part of the success of these interventions to the inclusion of trained interventionists screening and identifying both medical and mental health symptoms, resulting in referral to relevant services and education. The focus of the current review was on community CR programs delivered as part of standard health care services, rather than CR interventions designed specifically for a trial. As not all community CR programs routinely screen all patients for mental health symptoms, participants of the included studies would not have necessarily received any treatment specifically targeting their mental health. Other differences between this review and previous reviews which may explain the difference in findings, was the focus on patients of all ages and the type of heart condition. In the review by Gellis & Kang-Yi (2012), only four of the 11 trials reporting a significant reduction in depression symptoms included a CHD population, the other trials in which CR was associated with reduced depression studied heart failure populations that were not represented in this review. This finding suggests CR may be more effective at reducing depression in certain subgroups of patients, findings which may be obscured by the mixed samples employed in most studies included in this review. Exploring not only the components of CR programs that contribute to reducing depression and anxiety but also examining whether age, gender and different subtypes of heart disease respond differently to CR, will help inform health services how to structure and target CR programs to maximise their effectiveness.
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**Research implications**

Overall the quality of the evidence available was poor. Many studies included were not RCTs, as randomisation was considered by some studies with an ACR to be too impractical due to the possibility of patients in either group meeting up in CR sessions and discussing treatments (Lacey et al., 2004). Some authors deemed randomised studies to be unethical (Hevey et al., 2007). Indeed, in Austria, where one study took place (Benzer et al., 2007), to be able to compare treatments, the patients must have the choice between the new improved treatment and the current standard treatment. This makes non-randomised or observational studies an important option for future research in this area. Improving the quality and uniformity of future research is needed for the benefits of CR to be maximised.

CR is going to continue to be part of routine care as it has proven benefits for physical health, but as an intervention for reducing depression and anxiety, it does not appear from this review to have a significant impact on modifying a potentially modifiable risk factor. This review justifies exploring the impact of enhancements to CR which may have the potential to reduce depression and anxiety.

There is a need for larger scale studies in this area that have the capacity to recruit a larger number of participants, including a more heterogeneous population, to include more women and people from ethnic minorities. Low participation of cardiac patients was noted as an issue for studies (Grace et al., 2008; Jones et al., 2006; Lacey et al., 2004), as was recruiting participants from non-Caucasian populations (Beckie, 2006). This lack of diversity reduces the generalisability of the results, and small sample sizes may mean that small effects are masked, and subgroup analyses cannot be conducted, despite them have potentially different findings.
Research limitations

This review only included articles published in peer-reviewed journals and papers that were written or translated into the English language, which could result in a publication bias and an overestimation of the true effect. Many studies included did not have our research question as a primary aim, using depression and anxiety measures in these studies to inform different questions. This has implications for the conclusions of this review as the methodological quality rating of these studies would have been even less if they were assessed regarding their measurement of depression and anxiety. The studies in this review saw a considerable variation in interventions being offered, duration of programs and length of follow-up. Many used different scales, measuring different constructs of depression and anxiety. This made pooling the results quantitatively, inappropriate. Furthermore, service delivery and CR content differ from country to country, and even between different health authorities within countries, making direct comparisons or pooling inappropriate. It is worth noting that in the USA, CR may not be fully covered by a person’s health insurance, and the affordability of a CR program may impact on an individual’s motivation to complete a CR program or to even engage in behaviour change. If the participants have a program fee to attend CR, as they did in the Ornish Lifestyle intervention (Aldana et al., 2006) not only may this intervention be attended by more motivated individuals, they may be more likely to adhere to program guidelines that could have resulted in more favourable outcomes.

Clinical implications

From the evidence in this review, it appears that SCR does not have a robust and reliable effect to reduce depression and anxiety in cardiac patients. The evidence regarding ACR did provide some support that enhanced interventions might reduce
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depression and anxiety, however, this needs to be treated with caution as three out of the
four evaluations in which ACR reduced the symptoms of depression and/or anxiety
scored poorly for methodological quality. The one study that had a high-quality score
(IV=6) only examined depression. It is not possible to conclude from the evidence in this
review what the successful components of CR could be for reducing depression and
anxiety. The inclusion of a psychological component; motivational interviewing or stress
management component was common with the studies that demonstrated lowering of
depression and/or anxiety symptoms (Aldana et al., 2006; Beckie et al., 2011; Benzer et
al., 2007), with the exception of one study that saw depression reduced but did not
include a psychological component (Lacey et al., 2004). However, it is not possible to
conclude whether this was the successful component or whether it was a combination of
other components and duration of the intervention that resulted in the program’s
effectiveness. Therefore, the evidence for the inclusion of a psychological component is
not robust enough to inform clinical practice. It is not clear from the results of this and
previous reviews what the successful component and duration of a CR program are to
reduce to depression and anxiety (Linden, Phillips, & Leclerc, 2007; Rutledge et al.,
2013). A combination of therapies may prove to be a promising approach (Rutledge et
al., 2013). Without this knowledge, it is not possible to inform clinical practice.

There is evidence to suggest that targeting interventions tailored to women only
may be effective. ACR when delivered to women only, with a motivational interviewing
component to affect behavioural change, outperformed SCR, after controlling for
exercise, education, and CR attendance, this suggests the additional strategies of
motivational interviewing aimed at women only is likely to explain the reduction in
depression (Beckie et al., 2011). The women-only CR saw a higher attendance rate, had
a greater reduction in depression, along with an increase in vitality and general health,
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than the traditional CR group, with improvements sustained at six month follow-up (Beckie et al., 2011). Targeting interventions for women is important as women have worse cardiac outcomes (De Leon et al., 1998), they are less likely to attend or complete CR (Swardfager, Herrmann, Marzolini, Saleem, et al., 2011), and are at greater risk of having anxiety and depression, compared to men (Kessler et al., 2005). Evidence from recent meta-analyses compared psychological treatments (PT) to UC and found the effect sizes for reducing depression and anxiety were small, reaching significance only in studies examining depression in men (Linden, 2013). Gender specific CR may be an effective way to address the gender disparities in rehabilitation. This disparity raises the question of whether other subgroups could benefit from tailored, rather than general, CR programs.

The risk for further cardiac events and mortality is greater in cardiac patients with clinical levels of depression and/or anxiety (Goyal, Idler, Krause, & Contrada, 2005). Despite this, no study in this review included patients meeting a clinical threshold for anxiety or depression. All studies reporting a significant reduction in depression and anxiety are based on samples with baseline depression and anxiety levels within the normal range. To address the increased risks experienced by this population the effectiveness of these interventions should be examined in populations with clinical depression or anxiety, or symptoms above the threshold for normal. This observation is in line with previous reviews evaluating psychological interventions for cardiac patients, which have noted that only a small number of studies have targeted clinically depressed and anxious populations (Rutledge et al., 2013; Whalley, Thompson, & Taylor, 2012a). A recent review examining both mental health trials and CR programs for treating depression in cardiac patients, found trials which did not select participants meeting
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criteria for depression demonstrated the smallest effect size for reducing depression (Rutledge et al., 2013).

CR was not developed specifically to impact upon anxiety and depression. However, it is an effective intervention for reducing cardiac patient’s morbidity and mortality through modifying other risk factors and serves as an important part of the care and rehabilitation of these patients (Rutledge et al., 2013). However, as depression and anxiety appear to be important risk factors not reliably modified by CR, consideration needs to be given to whether changes to SCR might result in meaningful changes in anxiety and depression or whether the focus should be shifted to delivering separate interventions for this group. At present, the evidence is not available to answer what is the best approach to providing services effectively to reduce depression and anxiety in this population.

Conclusions

Evidence supports CR as an important intervention for all cardiac patients to attend for an optimal recovery after a cardiac event, reducing both mortality and morbidity (Rutledge et al., 2013). What is unclear from the current literature is whether SCR or ACR can reduce symptoms of depression and anxiety. Based on evidence from both RCTs and observational studies it is unlikely that SCR is effective at reducing either depression or anxiety symptoms. The evidence suggests that ACR is successful in reducing depression and anxiety symptoms when compared to SCR and UC, although poor methodological quality of the included studies suggests that further, more rigorously designed, research should be conducted. The design of future studies should be informed by the shortcomings that were identified in this review. Due to the poor methodological quality of the evaluations identified, observed effects of the studies in this review may be
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the result of processes other than the intervention, including selection biases, lack of control for potentially confounding factors and/or socially desirable reporting or demand characteristics. Future RCTs and observational studies need to examine whether CR is effective at reducing depression and anxiety in patients who at baseline meet criteria for depression and anxiety. These studies should focus on subgroups such as women and explore potentially effect enhancing components, such as stress management.
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Chapter 4 CR: The role of psychological distress on CHD recovery and CR: A quantitative study

The role of psychological stress in CHD recovery and cardiac patients’ decision to attend and complete CR

After experiencing a cardiac event, a patient can be very vulnerable both physically and emotionally. How patients respond to their cardiac events can influence the progression of their disease. Patients are encouraged to attend CR programs to improve health, well-being, and cardiac outcomes (National Institute for Health and Care Excellence, 2007). As discussed in Chapters 1 and 3, there are many benefits to be gained from attending CR. These programs reduce the risk of mortality from a recurrent event by 26% (Taylor et al., 2004), a non-fatal recurrent event by 38%, and all-cause mortality by 13% (Clark, Hartling, Vandermeer, & Mcalister, 2005). Whether these benefits extend to improvements in psychological health remains unknown. The systematic review presented in Chapter 3 was unable to answer this question, due to the limitations of the studies included leaving the question open about how successful CR is at changing negative psychological factors. Furthermore, negative psychological factors are implicated in non-attendance and non-completion of CR. For cardiac patients to have the most optimal recovery from a cardiac event attendance and completion of CR is important. Understanding the role of negative psychological factors on attendance and completion at CR is equally as important as understanding how effective CR is at treating them or whether other interventions may be more successful.

This current study explores the effects psychological distress has on CR attendance and completion either directly or indirectly through other modifiable psychological factors. Exploring these factors will make it possible to identify
modifiable psychological variables that could be the target of future interventions to increase both CR attendance and completion.

**Barriers to CR attendance and completion**

CR is an effective intervention for reducing the risks of morbidity and mortality in cardiac patients (Rutledge et al., 2013). Despite the effectiveness of CR, attendance rates remain low, with 20-50% of cardiac patients attending (Beswick et al., 2005; Bethell, Lewin, & Dalal, 2009; Jackson, Leclerc, Erskine, & Linden, 2005; Yohannes et al., 2007). Drop out rates for CR are also high with studies reporting this to be between 40 and 50% (Sanderson, Phillips, Gerald, DiLillo, & Bittner, 2003). Low attendance rates are associated with both modifiable and non-modifiable factors. Non-modifiable factors include older age and gender (Cooper, Jackson, Weinman, & Horne, 2002; Yohannes et al., 2007), ethnicity (Mochari et al., 2006), comorbidities (Daly et al., 2002; Yohannes et al., 2007) and lower social economic status (Lane, Musgrave, Freeman, Tod, & Scott, 2001). Modifiable factors include referral by a physician (Daly et al., 2002), and patient transportation (Grace et al., 2009). Despite attempts to address and overcome these barriers, there has been little impact on attendance and drop out rates (Sage, 2013). A better understanding of the factors associated with both attendance and completion are required to increase the uptake of CR.

In more recent years, the research focus has shifted to exploring modifiable psychological factors that may act as barriers to attendance. Psychological factors included as possible barriers are depression and anxiety (Swardfager et al., 2011; Whitmarsh, Koutantji, & Sidell, 2003; Yohannes et al., 2007, Lane 2001), illness beliefs (Cooper et al., 2007; French et al., 2006), treatment beliefs (Cooper et al., 2007), and a
person’s intention to attend CR (Maddison & Prapavessis, 2004). A more in-depth discussion of these psychological factors is presented in the following sections.

The role of depression and anxiety in CR attendance and completion

The evidence is mixed for the role of depression and anxiety in predicting CR attendance. Some studies report depression symptoms to be a predictor of CR attendance (Glazer et al., 2002; Whitmarsh et al., 2003). Other studies found depression symptoms to be a predictor of non-attendance (Kronish et al., 2006; Lane et al., 2001; Tolmie et al., 2009). Contrary to either of these findings, other studies found depression symptoms to have no effect on CR attendance (Farley, 2003; Shanks, Moore, & Zeller, 2007; Steg et al., 2002). Studies examining the role of anxiety in predicting CR attendance similarly report mixed results. A handful of studies support an association between anxiety symptoms and CR attendance (Farley, 2003; Jackson & Emery, 2013; Whitmarsh et al., 2003), whereas other studies report anxiety to predict non-attendance (Kuhl, Fauerbach, Bush, & Ziegelstein, 2009; Lane et al., 2001). It is notable, an association between patients with anxiety and depression and an increased likelihood of attending CR is reported in studies with male-only samples (Glazer et al., 2002; Whitmarsh et al., 2003) or in samples including both men and women, the effect is only reported in men (Farley, 2003). Studies reporting depression as a predictor of non-attendance included more diverse samples. These findings, reporting a different effect between men and women warrants further investigation. It is possible depression and anxiety may exert sex-specific effects on CR attendance, suggesting the importance of examining men and women separately.

The role of depression in the completion of CR appears to be more consistent than the evidence for anxiety. Cardiac patients with depression are less likely to complete CR
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than patients with no depression (Caulin-Glaser, Maciejewski, Snow, LaLonde, & Mazure, 2007; Glazer et al., 2002; Sanderson & Bittner, 2005; Swardfager et al., 2011; Turner, Bethell, Evans, Goddard, & Mullee, 2002). Depression predicts non-completion in both women-only samples (Sanderson & Bittner, 2005), and in samples predominantly made up of male participants (Caulin-Glaser et al., 2007). The effect of depression on non-completion appears to be consistent in studies measuring depressive symptoms (Glazer et al., 2002) and depressive disorders (Swardfager et al., 2011). Unlike depression, not as many studies have examined the role of anxiety on CR completion. The studies that exist found anxiety symptom to predict non-completion of CR (McGrady, McGinnis, Badenhop, Bentle, & Rajput, 2009; Yohannes et al., 2007).

The role of other psychological factors in CR attendance and completion

It is important to explore how depression and anxiety exert their effects on attendance and completion of CR, to identify whether modifiable factors are contributing to non-attendance and non-completion of CR. It is possible that their effect is through other psychological factors, which may be easier to identify or modify than depression and anxiety themselves. Illness perceptions are modifiable psychological variables found to predict CR attendance (French et al., 2006). Recent evidence has linked both depression and anxiety with negative illness perceptions in cardiac patients (Foxwell, Morley, & Frizelle, 2013; Stafford, Berk, & Jackson, 2009). Despite there being evidence to suggest there exists a potential link between depression, anxiety, and illness perception, the relationship between these variables has not yet been fully investigated to explain attendance and completion of CR.

The role of illness perceptions in CR attendance and completion. Illness perceptions have been linked to both CR attendance and completion (Whitmarsh et al.,
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2003). The perceptions a patient has of their heart disease can impact their decision to attend CR and undertake other health changing behaviours (Pattenden, Watt, Lewin, & Stanford, 2002). Much health research has tried to understand what influences a person’s motivation and intention to adhere to treatment programs, both regarding perceptions and cognitive factors (Leventhal, Leventhal, & Contrada, 1998). As discussed in Chapter 1, a widely applied model to explain the relationship between illness perceptions, emotional and behavioural responses to illness is the Common-Sense Self-Regulatory Model (CSRM). The model proposes that when people are faced with an illness such as CHD, to make sense of their illness they develop both emotional and common-sense cognitive representations of their illness. The CSRM has been used to examine how these illness perceptions affect both coping and outcomes in many chronic diseases.

A meta-analysis investigating how illness perceptions affect attendance at CR programs concluded a person’s perception that they can control their illness was the biggest predictor of attendance (French et al., 2006). However, the effect sizes were small, with illness perceptions only explaining 5% of the variance (French et al., 2006). It is probable, given the small effect size reported from the meta-analysis, that targeting illness perceptions alone will not change the likelihood of patients’ attending or completing CR (French et al., 2006). The authors concluded that other variables might be more useful for predicting attendance at CR, such as patient’s beliefs about treatment.

The role of treatment beliefs and intentions in CR attendance and completion.

Patients’ treatment beliefs (Cooper et al., 2007) and their intention to attend CR (Modica et al., 2014) are psychological variables worthy of consideration when exploring predictors of CR attendance and completion. Patients’ beliefs about CR contribute to whether patients attend CR or not (Cooper, Jackson, Weinman, & Horne, 2005; Cooper
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE et al., 2007). In a range of chronic illnesses, treatment beliefs explain more of the variance than illness perceptions. An extension of the CRSM, the Necessity-Concerns Framework (Horne, 1997), investigates patients’ beliefs about the necessity of their treatment. Patients’ beliefs about treatment differ between those who attended CR compared to those who did not attend (Cooper et al., 2007). Patients who attended CR were more likely to believe that attending CR was necessary and understood the importance of its role in the recovery from a cardiac event (Cooper et al., 2007). Although it was not found to be a statistically significant, patients who had greater concerns over taking part in the exercise component of CR were less likely to attend. Limited data exploring patient’s treatment beliefs raises the need for replication. A person’s intention to change their behaviour has been found to be predictive of adopting healthy behaviours (Bandura, 1977). Few studies to date have explored the intention to attend CR, and those that have found it not to be a good predictor of CR attendance on its own (Cooper et al., 1999). Of the people in sample who indicated they intended to attend, only 40% attended. Replication of this finding in other populations is needed to examine the role of patient’s intentions to attend CR with other potentially influential psychological factors such as depression and anxiety symptoms, as earlier research did not control for these psychological factors. Identifying psychological predictors of CR attendance and completion is important for the development of interventions and strategies to increase patient participation in CR programs, but it is as equally important to understand whether attendance and completion of CR can reduce depression and anxiety.

The impact of CR attendance and completion on psychological health

The previous chapter attempted to understand whether CR was effective at reducing depression and anxiety. From the available evidence presented in this chapter,
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the findings were inconclusive. The recommendations arising from the review was for future research to examine participants reporting elevated symptoms of depression and anxiety at baseline and for appropriately designed studies to provide a valid estimate of CR’s effectiveness regarding improving psychological health. The current study, therefore, attempts to address these limitations when examining the impact of CR on psychological factors.

It has been claimed there is a direct relationship been illness perceptions and depression, with interventions aimed at changing illness perceptions also improving depression (Grace et al., 2005). A meta-analysis found illness perceptions, in particular; consequences, lower control, and a longer timeline, are related to psychological distress (Hagger & Orbell, 2003). Patients who believe their cardiovascular disease would last a long time and cannot be cured are more likely to develop depression (Dickens et al., 2008). However, the complexities of the relationship between these variables are not entirely understood.

Interventions aimed at changing cardiac patient’s illness perceptions are successful at getting inpatients to perceive their illness as less threatening. Patients who received interventions targeting negative illness perceptions returned to work quicker and reported less chest pain than patients in comparison groups (Broadbent, Ellis, Thomas, Gamble, & Petrie, 2009; Petrie, Cameron, Ellis, Buick, & Weinman, 2002). There is a paucity of research examining whether CR is an effective intervention at modifying illness perceptions. CR is made up of components that could target patient’s perceptions about their heart disease through education and exercise sessions. A recent study found CR was effective at changing illness perceptions (Janssen, De Gucht, van Exel, & Maes, 2013). The authors concluded after attending CR, patients reported a change in how they perceived their heart disease, perceiving fewer consequences,
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experiencing fewer symptoms, believing they had more control and a greater understanding of their heart disease than they did before attending CR. As there was no comparison group included in this study, it was not possible to conclude these changes were due to CR or changes in perceptions over time. Replication of this study with a comparison group and concurrent measurement of psychological distress would assist in increasing our understanding of the relationship between, illness perceptions, depression and anxiety.

The effectiveness of CR to improve CR beliefs has previously not been investigated. It would appear CR beliefs have only been explored in relation to predicting attendance. By measuring CR beliefs after the completion of CR, it will be possible to understand whether attending CR modifies these beliefs and whether depression and anxiety have an effect on CR beliefs.

Summary

Previous research has not been able to sufficiently explain why patients do not attend or complete CR. Few studies to date have examined the role of depression and anxiety in how patients make the decision to attend CR, with the findings from these studies being inconsistent. It is possible that depression and anxiety have an impact on patients’ illness perceptions, which, in turn, have been found to predict attendance (French et al., 2006). Patients’ CR beliefs are presented in the literature as a predictor of attendance (Cooper et al., 2007), yet is it unclear whether depression and anxiety have an effect on these beliefs. The effect of depression and anxiety on patients’ intentions to attend CR has not previously been explored.

It is unclear from the evidence the impact CR has on the relationship between illness perceptions, depression and anxiety. Illness perceptions have been directly related to depression and anxiety (Grace et al., 2005). It has been demonstrated that negative
illness perceptions can be successfully changed over time with both targeted interventions and CR (Broadbent et al., 2009; Petrie et al., 2002). It is unclear whether CR attendance and completion could successfully change illness perceptions in patients with depression and anxiety, neither is it understood whether a change in illness perceptions could reduce depression and anxiety.

CR is the standard treatment program available, offered to patients after a cardiac event. Plenty of evidence supports the effectiveness of CR to reduce the morbidity and mortality, yet it is unclear whether CR can reduce psychological distress. Patients with elevated depression and anxiety symptoms are at an increased risk of worse cardiac outcomes. Therefore, it is important to understand how best to treat these patients to improve not just their outcomes but to increase their quality of life and inform clinical practice. As CR is a readily available intervention, it is of value to determine how cardiac patients make the decision to attend and complete CR. It is also important to establish whether CR is effective in reducing depression and anxiety symptoms. The proposed model of the predicted processes underlying this study suggests that depression and anxiety may directly influence the decision to attend and complete CR, and illness perceptions, cardiac beliefs and intentions to attend or complete CR may modify this relationship. It is also predicted that CR attendance and completion can change depression, anxiety, illness perceptions and cardiac beliefs (Figure 3).

Figure 3. Proposed model of the processes underlying this study
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Aims of study

This exploratory study has two main aims arising from gaps in the current literature. The first aim is to explore whether depression and anxiety symptoms affect attendance and completion of CR. Furthermore, this study aims to investigate how depression and anxiety influence CR attendance and completion by exploring the potential for illness perceptions, CR beliefs, and CR intentions to modify this relationship.

The second aim is to explore the effect of completion and attendance at CR on participants’ anxiety and depression symptoms, illness perceptions and CR beliefs. The second part of this aim will specifically explore patients with elevated levels of depression and anxiety at baseline, compared with those patients with scores in the range for normal on the HADS.

Method

A prospective cohort study was conducted to explore the study’s two aims. These aims were to examine the role of psychological variables in cardiac patients’ attendance and completion of CR, and the impact of CR attendance and completion on psychological variables.

Sample

Recruitment of participants was conducted through two hospitals in the South West Sydney area. Research ethics approval was obtained from South Western Sydney Local Health District (SWSLHD) in September 2012. Between, September 2012 and January 2014, patients who had been admitted to hospital for an acute coronary syndrome and who were eligible for CR were invited to participate in the study. To meet the
study’s inclusion criteria, participants must have been recently discharged from hospital after an admission for an acute myocardial infarction (AMI), angina or revascularisation procedure such as a percutaneous coronary intervention (PCI), or a coronary artery bypass graph (CABG). Participants needed to have sufficient English to be able to complete the baseline and follow-up questionnaires. Participants were excluded and did not receive questionnaires if they were admitted to hospital for heart failure or arterial fibrillation.

The two recruiting hospitals distributed 300 questionnaire packs. Overall 53 questionnaires packs were returned to the lead researcher. Of these, eight people returned uncompleted questionnaire packs informing the researcher they did not wish to participate, only 45 (15%) questionnaires were returned completed. Three questionnaires were completed by participants who did not meet the study’s inclusion criteria as they were not admitted to hospital for an ACS. Follow-up questionnaires were sent to the 42 participants who had completed the baseline questionnaire and met the study’s inclusion criteria, 25 participants completed and returned a questionnaire. Of the 42 participants who completed baseline questionnaires, three participants were excluded as there was no information available on whether they attended or completed CR. These three participants did not give permission for the lead researcher to contact CR services to confirm CR attendance and completion neither did they complete a follow-up questionnaire which contained items about CR attendance and completion. This left a final baseline sample of 39 participants (see Figure 3).
300 baseline questionnaire packs were sent to eligible cardiac patients from staff at recruiting hospitals

- 53 participants returned a baseline questionnaire
- 45 participants completed a questionnaire

42 participants completed baseline questionnaire

- 36 participants gave permission to access hospital records
- 6 participants did not give permission for CR access to records and were excluded

42 sent follow-up questionnaires

- 22 follow-up questionnaires returned
- 3 completed a follow-up questionnaire

25 follow-up sample

- 14 did not complete a follow-up questionnaire
- 3 did not return a follow-up questionnaire and were excluded as it was unknown whether they attended CR

39 baseline sample

- 28 attended CR
- 11 did not attend CR

CR sessions attended was not available for 3 participants

- 18 did not completed CR
- 7 completed CR

- 6 did not attend CR
- 19 attended CR
- 7 completed CR
- 12 did not complete CR

Figure 4. Recruitment flow diagram
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Procedure

In both recruiting hospitals, a member of the nursing staff was responsible for identifying from admission records, those patients who met the inclusion criteria. Shortly after discharge from hospital, participants who met the studies inclusion criteria were sent a questionnaire pack containing a letter of invitation, participant information sheet and consent form, the baseline questionnaire, a follow-up contact sheet, and a reply paid envelope (see Appendix C). Consent was requested from participants for the researcher to contact the participating Cardiac Rehabilitation Services to confirm CR attendance, and if they did attend, how many sessions they attended. Contacting CR services was an additional method used to allow the researcher to capture information about whether participants attended and completed CR even if a follow-up questionnaire was not returned. Once the follow-up data collection period was closed, a list of the 36 participants who consented to this information being collected was sent to the recruiting hospitals to gather information on the number of participants who attended CR. Only six participants did not give their permission for this information to be collected. Of these six participants, three had completed a follow-up questionnaire including information about attendance and completion. For the three participants who did not complete a follow-up questionnaire, it was not possible to determine whether they attended CR and were excluded.

To determine the numbers of participants who attended CR and the number of sessions completed, the information from the recruiting hospitals was used if available, as this was deemed a more reliable measure of attendance and completion than patient recall. For attendance, there was 100% agreement between the hospital information and follow-up questionnaires for the 36 participants with available information from both sources. However, for one of the recruiting hospitals, the information for CR completion
was not available at the end of the study. For the nine participants who were recruited from this hospital, only self-reported CR completion from the questionnaire could be used. Of these nine participants only one participant reported completing all CR sessions. All other participants reported completing less than 65% of CR sessions and were all categorised as non-completers, as completion was defined by attending 70% of all CR sessions. For the hospital with data for completion rates, CR completion rates were underestimated on the self-report questionnaires. For three participants it was only possible to get this information from the follow-up questionnaire as they did not give the researcher permission for the hospital staff to release this information.

Within the first six months of recruitment, only five questionnaires packs had been returned. Due to this very low response rate, two modifications were made to the recruitment process with approval from the relevant ethics committees. First, patients were offered a $20 gift card if they completed both a baseline and six-month follow-up questionnaire, as communicated in the questionnaire pack sent by the hospital staff. This modification increased recruitment to 10 participants in total. When this resulted in a limited improvement, a second modification was made with the doctoral candidate contacting all patients who were sent a questionnaire pack, with a follow-up telephone call to promote the study and remind them of the invitation to participate. This increased participation to 45 (15% of the 300 packs distributed). No differences were observed among the participants who were recruited by the three different methods of recruitment with regards to gender, age and the recruiting hospital.

**Measures**

Both the baseline and follow-up questionnaire used the same standardised measures and questions about health behaviours. Only the baseline questionnaire
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included a question to capture sociodemographic data and asked about intentions to attend CR.

Sociodemographic variables. On the baseline questionnaire, sociodemographic data was collected for each participant. This included age, marital status, employment status, country of birth and income.

Intentions to attend CR. Participants’ intention to attend CR was assessed using a single item on the baseline questionnaire, “are you planning to attend CR?”, with a yes/no response format.

Health behaviours. Questions about health behaviours were included in both the baseline and follow-up questionnaires and included exercise, weight, smoking and drinking behaviour, and whether the participant had a family history of heart disease, depression, and anxiety. Participants were asked to indicate whether they had a history of depression or anxiety and whether they were currently receiving treatment for anxiety or depression.

Hospital Anxiety and Depression Scale (HADS). To measure psychological distress (depression and anxiety), the HADS (Zigmond & Snaith, 1983) was used. This is a 14 item scale, with two seven-item subscales to measure anxiety and depression respectively. A minimum score of 0 and a maximum score of 42 is possible for the whole scale, while the maximum score on each subscale is 21. Subscale scores from 0-7 indicate depression or anxiety is not present; a score of 8-11 indicates borderline anxiety or depression is present, and a score of 12 or more represents clinical anxiety or depression. The HADS is a well-validated scale that has been used widely in cardiac populations and has been found to have good reliability with good internal consistency (Cronbach alpha between 0.80-0.93) (Herrmann, 1997). Using the HADS subscales, a
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categorical variable was created indicating the level of depression and/or anxiety at baseline experienced by participants. All participants with a score of 7 or below were categorised as ‘not depressed’, and those with a score of 8 or above were categorised as ‘depressed’. The same was done for anxiety.

Illness Perceptions Questionnaire – Revised (IPQ-R). Patients’ perceptions and beliefs about their health were measured using the IPQ-R (Moss-Morris et al., 2002). This scale represents the CRSM (Weinman, Petrie, Moss-Morris, & Horne, 1996). The scale measures both the cognitive and emotional representations of illness. Patients’ perceptions are measured using nine subscales. Seven of these subscales, together containing 38 items, are rated on a 5-point Likert scale; ”strongly disagree” to ”strongly agree” to measure; “timeline”, acute/chronic and timeline, “cyclical” (perceived duration of their heart disease); “consequences” (the expected physical, social and psychological outcomes); “cure and control, personal control” and “treatment control” (control or recovery from heart disease); “illness coherence” (understanding of their heart disease experience) and “emotional representation” (the psychological distress associated with heart disease). Cause and identity were measured differently. “Identity” (the symptoms associated with a person’s heart disease) was measured using 14 items, with yes or no response options. For “cause” (what participants’ thought caused their heart condition), 18 items were included along with a request to list in order of importance, three factors that they believed caused their heart condition. Identification of groups within causal beliefs (e.g. lifestyle; hereditary) can be found using factor analysis with a sufficient sample size (n=85). Due to the small sample size of this study, it was not possible to analyse the data from this subscale. The scores from the other subscales were used in the analyses, with higher scores on identity, timeline, and consequences indicating strongly
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held beliefs and perceiving negative consequences of their heart disease. A high score for cure/control, illness coherence and emotional representation indicate positive beliefs and understanding of their heart disease. The IPQ-R has been used for a number of illness conditions and has been established as reliable in previous studies (e.g., French et al., 2006), each subscale has a good internal consistency with Cronbach’s alphas ranging from 0.79 to 0.89 (Moss-Morris et al., 2002).

Beliefs about Cardiac Rehabilitation Questionnaire (BCRQ). Participants’ beliefs about cardiac rehabilitation were measured by BCRQ (Cooper et al., 2007). This 13 item questionnaire includes four subscales that evaluate; 1) “perceived necessity”, a higher score indicates that the person believes CR to be necessary and of benefit; 2) “concerns about exercise”, higher scores indicate the participant has a greater concern about the exercise component of CR; 3) “practical barriers”, a higher score indicates a perceiving more practical barriers to attending CR; 4) “perceived personal suitability”, a higher score indicates that CR is perceived as not suitable for the participant. These four subscales use a 5-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’.

The total scores for each of the four subscales on the BCRQ were used for analyses. Each subscale has acceptable internal reliability evidenced by Cronbach alphas, ranging between 0.70 – 0.79. For each subscale the Cronbach alphas were as follows; Perceived necessity $\alpha=0.71$; concerns about exercise $\alpha=0.79$, practical barriers $\alpha=0.70$ and perceived suitability $\alpha=0.74$ (Cooper et al., 2007).

CR attendance and CR completion. CR attendance was defined using hospital attendance data for participants who consented to this information being accessed. Participants were categorised as either a ‘non-attender’ (attended no sessions of CR) or ‘attender’ (attended one session or more). Based on the number of sessions of CR a
participant attended it was calculated whether CR had been completed. The maximum number of sessions a participant could attend at recruiting hospitals was 18 sessions. A participant was deemed to be a CR completer if they attended 70% of the 18 possible sessions, based on the cut-off used in previous studies of CR (Swardfager et al., 2011). The information for the number of CR sessions attended was not available for 7% (3 of the attending participants).

Sample size and power calculations

To calculate the sample size required for this study, the power calculation was based on the HADS, using the observed between-group differences reported in previous studies (Dalal et al., 2007; Sanderson et al., 2003; Whitmarsh et al., 2003). The sample size was calculated using power sampling software (Lenth, 2001). With a sample size of 205 cardiac patients this study would be powered at 80% with an alpha of 0.05, to detect effect sizes for the difference between non-attenders and attenders of CR, and to detect a difference in HADS scores considered clinically significant (Dalal et al., 2007).

Statistical analysis

Data was analysed using SPSS statistical software (version 22). Data cleaning and screening was undertaken to check for inaccurate data entry and missing variables. An examination of the descriptive data was performed. Descriptive baseline characteristics were presented as means and standard deviations for continuous variables, and as percentages for categorical variables. Continuous variables were assessed for normality using histograms. The distribution was observed to be normal for all continuous variables.

Using data from participants’ baseline questionnaires bivariate analyses were computed as an initial step to explore relationships between depression and/or anxiety,
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CR attendance, CR completion, illness perceptions and CR beliefs. Pearson product moment correlations were used to examine bivariate relationships between depression and anxiety, illness perceptions and CR beliefs. Point biserial correlations were used to assess whether depression and anxiety, illness perceptions and CR beliefs were associated with CR attendance and completion. Logistic regression models were built using participant’s responses to the baseline questionnaire to examine predictors of attendance and completion of CR while adjusting for other psychological factors. To examine whether attendance and completion of CR differed between people categorised with or without depression or anxiety, Fisher’s exact tests were used. Cohen’s d was used to interpret the strength of any effect size, with a small (0.2), medium (0.5) and large (0.8) (Cohen, 1977).

Two mixed between-within analyses of variance were used to assess whether attending CR or completing CR were associated with improved psychological outcomes using longitudinal data. As the sample was small, Fisher’s exact tests of independence were used to examine if there was a relationship between the following categorical variables: depression and anxiety, self-report intention to attend CR; and CR attendance and CR completion.

All tests were 2-tailed and evaluated for statistical significance using a probability value of .05 as the criterion. Post hoc power analyses were performed to determine which comparisons between psychological variables reached statistical significance. It was not possible to run this type of post hoc tests for all other comparisons, due to the small sample size, as there were not enough recommended cases for each cell. As this was an exploratory study, the expected direction of relationships between variables was not predicted. A decision was made to run these tests and to observe the potential
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relationship between the included variables while noting that caution was warranted in interpreting any of the results which were significant.

Results

Baseline characteristics of the sample

Baseline questionnaires were received from 42 participants. Of this 42, 3 participants were not included (see Figure 3), leaving a final baseline sample of 39 participants (Table 8). This was a predominantly male sample with men accounting for 74% of all participants at baseline. The mean age for this sample was 65.1 years (SD = 10.34 years), ranging from the youngest participant of 45 years to the oldest at 88 years. The mean BMI for participants was 28.5, which is in the overweight range. BMI scores ranged from 20.6, a healthy BMI, to 38.3, morbidly obese. The mean scores on the HADS for both depression (M = 5.8, SD = 3.67) and anxiety (M = 6.5, SD = 4.31) were in the normal range, however at baseline 12 (31%) participants had a depression score of 8 and above indicating depression and 14 (36%) participants had an anxiety score above 8 indicating anxiety. There were 7 (18%) participants who had a score indicating high distress, a score of 8 or above for anxiety and depression.

All 42 participants who returned a completed baseline questionnaire and met the study inclusion criteria were sent a follow-up questionnaire. Completed follow-up questionnaires were received from 25 participants. Not all participants who returned a follow-up questionnaire completed all subscales in the questionnaire. Where a subscale was not completed, the participant was excluded from the analysis for that particular subscale only.
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As shown in Table 8, the characteristics of participants who completed a follow-up questionnaire and those that did not return a follow-up questionnaire demonstrated a statistically significant difference on only two items. Participants who did not return a follow-up questionnaire were more likely to have a depression score in the moderate to clinical range $\chi^2(2, N=25) = 2.74, p = 0.04$ and were more likely to report that they were not planning on attending CR $\chi^2(2, N=25) = 3.14, p = 0.03)$. There were no other differences between participants.
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Table 8

Sample Demographics and clinical characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline N=39 n (%)</th>
<th>Follow-up n=25 (%)</th>
<th>No follow-up n=14 (%)</th>
<th>t-value* df p</th>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Men</td>
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<td>20 (80.00)</td>
<td>9 (64.29)</td>
<td>.74 1 0.21</td>
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<td>Age</td>
<td>65.13 (SD 10.34)</td>
<td>64.44 (SD 10.34)</td>
<td>66.41 (SD 9.73)</td>
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<td>BMI</td>
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<td>28.61 (SD 4.81)</td>
<td>28.5 (SD 5.00)</td>
<td>0.062 37 0.32</td>
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<td>8 (57.16)</td>
<td>0.85 3 0.19</td>
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<td>5 (20.00)</td>
<td>2 (14.28)</td>
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<td>Follow-up n=25 (%)</td>
<td>No follow-up n=14 (%)</td>
<td>t-value*</td>
</tr>
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<tr>
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<td>18 (72.00)</td>
<td>8 (57.14)</td>
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<tr>
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<td>20 (80.00)</td>
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<td>18 (72.00)</td>
<td>6 (42.85)</td>
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<td>&gt;8 (moderate – clinical range)</td>
<td>14 (35.90)</td>
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<td>7 (50.00)</td>
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ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

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<tr>
<th>Variable</th>
<th>Baseline N=39 n (%)</th>
<th>Follow-up n=25 (%)</th>
<th>No follow-up n=14 (%)</th>
<th>t-value*</th>
<th>df</th>
<th>p</th>
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<td>2 (14.28)</td>
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<td>2 (8.00)</td>
<td>2 (14.28)</td>
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<td>Are you planning on attending CR</td>
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<td>24 (61.54)</td>
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<td>Heard about CR</td>
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<td>2 (8.00)</td>
<td>1 (7.14)</td>
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* for the comparison between followed-up and lost to follow-up. Continuous variables are reported as means ± SD, categorical variables are presented as numbers and %. \( \chi^2 \) and paired sample t-tests for discrete and continuous variables, respectively; p>.05 for statistical significance. Not all questions were answered by all participants.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Relationship between depression and anxiety and attendance and completion of CR

No statistically significant relationship was reported between participants’ baseline depression symptoms and CR attendance \((r(38)=-.12)\) and CR completion \((r(25)=.05)\). There was also no statistically significant relationship found between anxiety symptoms and either CR attendance \((r(38)=-.14)\) or completion of CR \((r(25)=.03)\) (Table 9).

Relationship between treatment beliefs, illness perceptions and intentions and CR attendance and completion

One of the aims of this study was to explore whether anxiety and depression symptoms are related to CR attendance and completion and if a relationship existed whether this was due to other psychological factors. To explore whether there was a relationship between psychosocial variables and both CR attendance and completion, the first step was to explore the descriptive data; and the second step was to explore relationships between depression, anxiety and the other psychological factors.

Pearson product-moment correlations revealed no statistically significant relationship between CR attendance and participants’ illness perceptions; timeline (acute); timeline (cyclic); consequences; treatment control; illness coherence; emotional representation; identity. There were also no statistically significant relationships reported between CR attendance and CR beliefs; perceived necessity; concerns about exercise; practical barriers; and perceived suitability.

For CR completion and participants’ illness perceptions there was also no statistically significant relationship found for; timeline (acute); timeline (cyclic); consequences; treatment control; illness coherence; emotional representation; identity:
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

The same was also true for the following CR beliefs: perceived necessity; concerns about exercise; practical barriers; perceived suitability (Table 9).

There was no statistically significant relationship between depression symptoms, anxiety symptoms, for either CR attendance and CR completion. These results may potentially be due to the small sample size.
### ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Table 9

Pearson product-moment correlations between HADS, IPQ and BCRQ, including point biserial correlations for CR attendance, completion and intentions

<table>
<thead>
<tr>
<th>HADS</th>
<th>CR attendance</th>
<th>CR completion</th>
<th>Intention to attend CR</th>
<th>Depression</th>
<th>Anxiety</th>
<th>Perceived necessity</th>
<th>Concerns about exercise</th>
<th>Practical barriers</th>
<th>Perceived suitability</th>
<th>Timeline (acute, chronic)</th>
<th>Timeline (Cyclic)</th>
<th>Consequences</th>
<th>Treatment control</th>
<th>Illness coherence</th>
<th>Emotional representation</th>
<th>Personal control</th>
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</thead>
<tbody>
<tr>
<td>Depression</td>
<td>-.12</td>
<td>-.05</td>
<td>.25</td>
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<td></td>
<td>.36**</td>
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<td>Anxiety</td>
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<td>-.03</td>
<td>.24</td>
<td>.70**</td>
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<td>BCRQ scales</td>
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<td></td>
<td></td>
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<tr>
<td>Perceived necessity</td>
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<td>.23</td>
<td>-.28</td>
<td>-.36*</td>
<td>-.24</td>
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<td></td>
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<td></td>
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<tr>
<td>Concerns about exercise</td>
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<td>.36*</td>
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</tr>
<tr>
<td>Practical barriers</td>
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<td>.16</td>
<td>-.1</td>
<td>-.09</td>
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<td>Perceived suitability</td>
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<td>-.05</td>
<td>.06</td>
<td>.00’</td>
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<td>-.20</td>
<td>.34*</td>
<td>.33*</td>
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</tr>
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<td>-.12</td>
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<td>.31*</td>
<td>-.13</td>
<td>.34*</td>
<td>.17</td>
<td>.01</td>
<td>.05</td>
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<tr>
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<td>.02</td>
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<td>.45**</td>
<td>.49**</td>
<td>-.18</td>
<td>.47**</td>
<td>-.01</td>
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<td>.64**</td>
<td>.38*</td>
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<tr>
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<td>.28</td>
<td>-.07</td>
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<td>-.36*</td>
<td>.22</td>
<td>.42**</td>
<td>-.03</td>
<td>-.25</td>
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<td>.26</td>
<td>.61**</td>
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<td>-.02</td>
<td>-.28</td>
<td>-.22</td>
<td>-.19</td>
<td>.62**</td>
<td>-.02</td>
<td>-.1</td>
<td>-.03</td>
<td>-.28</td>
<td>-.08</td>
<td>.18</td>
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<td>.04</td>
<td>.76**</td>
<td>.76**</td>
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<td>.45**</td>
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<td>.24</td>
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<td>-.24</td>
<td>-.17</td>
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<td>.23</td>
<td>-.18</td>
<td>.004</td>
<td>-.28</td>
<td>-.19</td>
<td>.1</td>
<td>.09</td>
<td>.28</td>
<td>.44**</td>
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<td>.1</td>
<td>-.09</td>
<td>-.03</td>
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<td>-.04</td>
<td>.18</td>
<td>.17</td>
<td>-.03</td>
<td>.45**</td>
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(N = 39) ** significant at p <0.01  * significant at p< 0.05
Relationship between depression, anxiety, illness beliefs, beliefs about CR and intentions

In this next section the relationship between depression, anxiety symptoms, illness perceptions and CR beliefs is explored, as the understanding of the relationship between these variables was demonstrated to be limited in the introduction section of this chapter.

Depression and anxiety symptom scores were positively correlated with scores on the IPQ-R subscales for consequences, emotional representations and timeline (cyclical) and also with scores on the BCRQ subscale for concerns about exercise and perceived necessity. Both depression and anxiety scores were strongly positively correlated to emotional representation of heart disease (depression $r(36) = .76, p=.00$; anxiety $r(36) = .79, p=.00$). Depression and anxiety had a moderate positive relationship with perceived consequences (depression $r(36) = .45, p=.003$; anxiety $r(36) = .49, p=.003$). Depression and anxiety were also moderately correlated with perceiving heart disease timeline to be cyclical (depression $r(36) = .45, p=.01$; anxiety $r(36) = .31, p=.05$). Depression and anxiety had a moderate positive relationship on the BCRQ subscale with concerns about exercise (depression $r(37) = .41, p=.01$; anxiety $r(37) = .36, p=.03$) and only depression was moderately correlated with perceived necessity of CR (depression $r(36) = -.36, p=.03$). Thus participants with higher anxiety and depression scores perceived more serious consequences, believed they had less control over their heart disease, felt that their heart disease would be of a cyclical nature, had more negative emotional representations and more concerns regarding the exercise component of CR.

Depression was positively correlated on the IPQ-R with control over treatment (depression $r(36) = .38, p=.02$), indicating participants with higher scores for depression
perceived they had less control over the treatment of their heart disease. Anxiety scores were negatively correlated on the IPQ-R with control over treatment \((\text{anxiety } r(35) = -0.36, p=0.03)\). Participants with lower scores for anxiety perceived they had less control over the treatment of their heart disease. Depression was negatively correlated with perceived necessity of CR \((\text{depression } r(36)=-0.36, p=0.03)\), indicating that participants with lower scores for depression perceived CR to be less necessary.

**Can psychological variables predict attendance at CR and completion at CR?**

Logistic regression models were built to assess further the relationship of psychological variables on the attendance and completion of CR. A stepped model building approach was used to determine whether there was any observed relationship at baseline between depression and anxiety and attendance and completion at CR as a first step, and then whether this relationship is mediated by illness perceptions, CR beliefs and intention to attend CR as a second step. Two separate models were employed, one for attendance (Table 10) and the second for completion of CR (Table 10). No significant relationship was found between any of the psychological variables and either attendance and completion of CR. It is acknowledged that significant results were unlikely given no bivariate relationship was found. It was however recognised the possibility that including mediators in the model could reveal a significant relationship.
## ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

### Table 10

Logistic regression CR attendance and CR completion

<table>
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<tr>
<th></th>
<th>CR attendance</th>
<th>CR completion</th>
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<tbody>
<tr>
<td></td>
<td>Exp(b)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Depression</td>
<td>.85</td>
<td>.52 – 1.40</td>
</tr>
<tr>
<td>Anxiety</td>
<td>1.01</td>
<td>.67 – 1.53</td>
</tr>
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<td><strong>IPQ</strong></td>
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<tr>
<td>Perceived control</td>
<td>.45</td>
<td>0.29 – 1.49</td>
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<tr>
<td>Identity</td>
<td>.85</td>
<td>.61 – 1.19</td>
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<tr>
<td>Timeline</td>
<td>.96</td>
<td>.75 – 1.24</td>
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<tr>
<td>Timeline cyclic</td>
<td>.82</td>
<td>.53 – 1.27</td>
</tr>
<tr>
<td>Consequences</td>
<td>1.16</td>
<td>.74 – 1.81</td>
</tr>
<tr>
<td>Treatment concerns</td>
<td>1.07</td>
<td>.70 – 1.30</td>
</tr>
<tr>
<td>Emotional representation</td>
<td>.96</td>
<td>.81 – 1.30</td>
</tr>
<tr>
<td><strong>BCRQ</strong></td>
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<td></td>
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<tr>
<td>Perceived necessity</td>
<td>1.17</td>
<td>.86 – 1.60</td>
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<td>Concerned exercise</td>
<td>1.13</td>
<td>.69 – 1.84</td>
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<tr>
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<td>.87</td>
<td>.60 – 1.23</td>
</tr>
<tr>
<td>Perceived suitability</td>
<td>.65</td>
<td>.30 – 1.44</td>
</tr>
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</table>
Relationship between CR attendance and changes over time in psychological factors

Mixed between-within subjects analyses of variance were used to assess whether attending CR or completing CR was associated with a change in psychological outcomes for participants. The results for attending CR can be found in Table 11 and results for completing CR in Table 12. A statistically significant difference was found for the perceived necessity of CR between CR attenders and non-attenders ($F(1,20) = 17.1$, $p = .001$): participants who did not attend CR perceived CR to be significantly less necessary than those who attended. There was no difference in the change in depression, anxiety and other psychological variables between those who attended CR and those who did not, however, for all these comparisons, observed power was found to be insufficient. The null findings may, therefore, be the result of the inadequate statistical power rather than being indicative of no relationship.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Table 11

Between group effects: CR attendance and psychological variables (N=25)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Attended CR</th>
<th>Did not attend CR</th>
<th>Between group</th>
<th>Interaction effect</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>n</td>
<td>Baseline Mean (SD)</td>
<td>Follow Up Mean (SD)</td>
<td>n</td>
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<tr>
<td>Depression</td>
<td>19</td>
<td>4.52 (2.76)</td>
<td>4.32 (3.32)</td>
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<tr>
<td>Anxiety</td>
<td>19</td>
<td>5.52 (4.30)</td>
<td>4.78 (4.02)</td>
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</tr>
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<td>IPQ Timeline</td>
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<td>17.95 (5.19)</td>
<td>23.40 (5.28)</td>
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<td>Timeline Cyclic</td>
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</tr>
<tr>
<td>Consequences</td>
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<td>16.00 (4.00)</td>
<td>20.10 (4.30)</td>
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<td>Illness coherence</td>
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<td>18.34 (4.07)</td>
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<td>18.20 (4.40)</td>
<td>24.20 (3.80)</td>
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<td>18.70 (3.90)</td>
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<td>Emotional representation</td>
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<td>2.18 (4.90)</td>
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<td>BCRQ scales</td>
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<td>3.03 (1.59)</td>
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</table>
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Relationship between CR completion and changes over time in psychological factors

There was no significant difference in the extent to which anxiety or depression scores changed over time among participants completing CR compared to those who did not complete CR, however, there was insufficient power for both of these comparisons. A statistically significant difference was observed between completers and non-completers for two subscales on the IPQ. Participants who completed CR were found to have a greater belief in illness coherence ($F(1,16)=7.5$, $p=.02$, $d=.73$) than non-completers. CR completers believed they had greater control of their heart disease than non-completers of CR ($F(1,15)=5.4$, $p=.03$, $d=.59$). No other statistically significant differences were reported for any of the subscales on the IPQ, however all non-significant results had insufficient power.

There were no significant differences observed between completers and non-completers of CR on any of the subscales for the BCRQ. All non-significant results found for all sub-scales had insufficient power.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Table 12

Between-group effects – CR completion and psychological variables

<table>
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<th>Variable</th>
<th>Completed CR</th>
<th>Did not complete CR</th>
<th>Between groups</th>
<th>Interaction</th>
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<td>n Baseline</td>
<td>Follow Up</td>
<td>n Baseline</td>
<td>Follow Up</td>
</tr>
<tr>
<td>Depression</td>
<td>7 3.90 (2.73)</td>
<td>3.60 (2.88)</td>
<td>12 4.92 (2.81)</td>
<td>4.75 (3.60)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>7 5.43 (3.99)</td>
<td>4.71 (2.10)</td>
<td>12 5.58 (4.64)</td>
<td>4.83 (4.91)</td>
</tr>
<tr>
<td>IPQ</td>
<td>7 17.50 (7.11)</td>
<td>25.71 (3.38)</td>
<td>11 18.24 (3.89)</td>
<td>21.93 (5.86)</td>
</tr>
<tr>
<td>Timeline Cyclic</td>
<td>7 8.00 (1.25)</td>
<td>8.52 (1.77)</td>
<td>11 10.09 (2.32)</td>
<td>10.85 (3.15)</td>
</tr>
<tr>
<td>Consequences</td>
<td>7 15.86 (4.12)</td>
<td>20.97 (3.71)</td>
<td>11 16.12 (4.37)</td>
<td>19.55 (4.67)</td>
</tr>
<tr>
<td>Illness coherence</td>
<td>7 16.97 (2.59)</td>
<td>20.89 (3.24)</td>
<td>11 12.91 (3.21)</td>
<td>16.73 (3.80)</td>
</tr>
<tr>
<td>Personal control</td>
<td>6 21.00 (2.52)</td>
<td>26.17 (4.36)</td>
<td>11 16.72 (4.61)</td>
<td>23.18 (3.25)</td>
</tr>
<tr>
<td>Treatment control</td>
<td>7 16.54 (2.69)</td>
<td>20.82 (2.75)</td>
<td>11 14.96 (3.00)</td>
<td>17.34 (4.08)</td>
</tr>
<tr>
<td>Emotional representation</td>
<td>7 12.69 (4.92)</td>
<td>15.14 (2.97)</td>
<td>11 15.21 (5.35)</td>
<td>16.27 (4.29)</td>
</tr>
<tr>
<td>Identity</td>
<td>6 4.0 (6.23)</td>
<td>1.67 (4.08)</td>
<td>11 2.09 (4.70)</td>
<td>2.45 (5.47)</td>
</tr>
<tr>
<td>BCRQ scales</td>
<td>6 17.33 (2.56)</td>
<td>16.87 (2.72)</td>
<td>11 16.65 (2.13)</td>
<td>16.24 (1.56)</td>
</tr>
<tr>
<td>Perceived necessity</td>
<td>7 4.76 (1.56)</td>
<td>5.47 (2.15)</td>
<td>11 5.67 (1.98)</td>
<td>5.70 (1.67)</td>
</tr>
<tr>
<td>Exercise concerns</td>
<td>7 4.62 (1.67)</td>
<td>4.86 (1.57)</td>
<td>11 5.06 (1.74)</td>
<td>4.30 (1.34)</td>
</tr>
<tr>
<td>Practical barriers</td>
<td>7 3.29 (1.00)</td>
<td>3.21 (2.20)</td>
<td>10 3.15 (1.13)</td>
<td>2.90 (1.59)</td>
</tr>
</tbody>
</table>
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Relationship between participants with elevated levels of depression and anxiety symptoms and CR attendance and completion

Fisher’s exact tests were performed (Table 13) to explore whether those participants with depression and anxiety scores within the threshold for moderate to clinical anxiety and depression had a different likelihood of attending CR or completing CR compared with participants with anxiety and depression scores within the threshold for normal. No effect was found, suggesting that elevated levels of depression and anxiety are not associated with attending CR in this sample. There was also no relationship found between elevated levels of depression and anxiety and completion of CR. The effect size was small for all results (ranging from $d = .1 - .3$), suggesting that there is no evidence that there is a difference in participants with elevated levels of depression and anxiety symptoms and those with scores in the normal range on attendance and completion of CR.
This study had two main research aims, to understand the relationship between depression and anxiety symptoms and their role in CR participation. The first research aim was to understand how depression and anxiety symptoms affect attendance and completion of CR, exploring the potential for illness perceptions and CR treatment beliefs to modify the relationship. The second aim, explored how completion and attendance may impact depression and anxiety symptoms, exploring both illness perceptions, CR beliefs and intentions to attend CR as potential mediators. Neither depression nor anxiety symptoms at baseline were found to affect either attendance or completion of CR. Although relationships were observed between depression, anxiety, illness perceptions and CR beliefs, none of these variables were found to predict attendance or completion of CR. Attending and completing CR was not found to be associated with a reduction in depression or anxiety in this sample. The only variable with a statistically significant difference between CR attenders and non-attenders was

<table>
<thead>
<tr>
<th>CR status</th>
<th>Depressed</th>
<th></th>
<th>Anxiety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depression &lt;8 n (%)</td>
<td>Depression &gt;8 n (%)</td>
<td>Anxiety &lt;8 n (%)</td>
<td>Anxiety &gt;8 n (%)</td>
</tr>
<tr>
<td>Did not attend CR</td>
<td>5 (13.16)</td>
<td>5 (13.16)</td>
<td>4 (10.53)</td>
<td>6 (15.79)</td>
</tr>
<tr>
<td>Attended CR</td>
<td>21 (55.26)</td>
<td>7 (18.42)</td>
<td>20 (52.63)</td>
<td>8 (21.05)</td>
</tr>
<tr>
<td>Did not complete CR</td>
<td>13 (52.00)</td>
<td>5 (20.00)</td>
<td>12 (48.00)</td>
<td>5 (20.00)</td>
</tr>
<tr>
<td>Completed CR</td>
<td>5 (20.00)</td>
<td>2 (8.00)</td>
<td>6 (24.00)</td>
<td>2 (8.00)</td>
</tr>
</tbody>
</table>
perceived necessity of CR. Participants who did not attend CR perceived CR to be significantly less necessary than those who did attend. Both illness coherence and personal control was significantly different between completers and non-completers of CR. However, due to the small sample size, the findings need to be treated with caution.

Relationship between depression and anxiety and CR attendance and completion

Attendance and completion of CR was not predicted by depression and anxiety symptoms in this study. Previous evidence is mixed on the role of depression and anxiety on CR attendance with some studies finding they do not predict attendance (Farley, 2003; Grace et al., 2002; Shanks et al., 2007) while others have found they do predict attendance (Glazer et al., 2002; Whitmarsh et al., 2003). It is very probable the null findings of this current study may be the consequence of insufficient power to detect any effects due to a small sample size. Therefore, it is not possible to conclude that these psychological variables do not predict attendance or completion, rather this is a result of an underpowered analysis that needs to be replicated with a much larger sample.

Relationship between psychological variables and CR attendance and completion

Depression and anxiety symptoms were not associated with CR attendance or completion. Therefore it was not possible to test the potentially mediating role of other psychological factors in the relationship between depression and anxiety and CR attendance and completion. However, the value of the information from the bivariate analyses between psychological factors and both CR attendance and completion, is still of merit, especially as it was clear from the introduction the evidence base in this area is not well established. None of the psychological variables included in this study were associated with attendance and completion of CR. Again, it is possible that these null findings are due to insufficient statistical power. Indeed, this is likely, given that the null
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findings are not consistent with the evidence that does exist. Previous research has demonstrated CR attenders differ from non-attenders with attenders believing CR to be necessary for their recovery from heart disease (Cooper et al., 2007). The illness perceptions of patients attending CR also differ from non-attenders, by attenders perceiving they have more control over their heart disease than non-attenders (French et al., 2006). There was no relationship found between the psychological variables included in this study and attendance and completion of CR, however, a relationship was observed between the included psychological variables.

**Relationship between depression and anxiety and psychological variables**

Although not the intended purpose of this study, the nature of the relationships between depression and anxiety symptoms and the other psychological variables measured is worth reflection. Although no psychological variables predicted attendance and completion at CR, there were some significant relationships observed. Elevated levels of depression symptoms were found to increase concerns regarding the exercise component of CR. Although to my knowledge CR beliefs and their relationship with depression and anxiety have not been explored before, this result is not surprising. In previous studies, increased anxiety and depression symptoms reduce adherence to physical exercise programs (Yohannes et al., 2007) and in men, this is associated with taking less exercise (Grace et al., 2005). The finding from this current study supports evidence that patients with depression might have more concerns over the exercise component in CR, and the exercise component may be more of a barrier for patients with depression and anxiety symptoms, resulting in reduced attendance at CR. This result may be worthy of further investigations.
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The relationship between depression, anxiety and illness perceptions in this current study supports existing evidence suggesting specific illness perceptions are associated with elevated levels of depression and anxiety symptoms (Grace et al., 2005). Participants in this study with elevated levels of depression and anxiety symptoms perceived their heart disease as having more serious consequences, more negative emotional representations, being cyclical and having less control over their disease. These findings concur with previous findings, where low personal control of heart disease (Stafford et al., 2009) and negative emotional representations (Hermele, Olivo, Namerow, & Oz, 2007) were related to elevated symptoms of depression. However, not all relationships between depression, anxiety and illness perceptions found in this study are consistent with previous findings. Previous studies found the negative consequence of illness to be related to increased symptoms of depression (Grace et al., 2005; Stafford et al., 2009). Whereas in this current study, participants with depression and anxiety scores in the normal range perceived they had less control over their treatment, this is contrary to earlier evidence that reported the reverse (Grace et al., 2005). It is unclear why this discrepancy was found in the present study, aside from the previously mentioned small sample size and consequent lack of power.

Participants who had greater concerns about participating in the exercise component of CR expected a longer duration of their disease, their symptoms to be more cyclical, perceived more serious consequences of having heart disease and had more negative emotional beliefs. This finding supports recent evidence that patients with lower adherence to exercise reported perceiving more severe illness consequences with their heart disease (Platt, Green, Jayasinghe, & Morrissey, 2014). The authors concluded this might be because patients who believed their CHD to be more serious were more concerned by the potential risks of exercise. However, patients who believed their CHD
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as more chronic, cyclical and experience more emotional consequences may not just perceived exercise as a potential risk, but these may not fully understand its benefits for recovery. Due to the small sample size, however, it is important to confirm this finding with a larger sample. Exercise is an important part of recovery from a cardiac event, if patients perceive exercise as a potential risk rather than a benefit, this could be an important perception for health professionals to address with their patients.

How effective is CR at reducing depression and anxiety symptoms?

The data from this study indicated that CR was not successful at reducing depression or anxiety symptoms. No difference was found between participants who either attended or completed CR, compared to those who did not. While the finding in this study cannot be considered trustworthy given the sample was underpowered to detect a significant change if it did occur, it is consistent with current evidence (Benzer et al., 2007; Grace et al., 2008; Hevey et al., 2007; Zwisler et al., 2008). With such a small sample it was not possible to examine whether CR is effective at reducing depression and anxiety among participants with elevated levels of depression and anxiety, despite this being a recommendation from the systematic review in Chapter 3. Instead, it was only possible to examine whether there was a change in the mean scores for anxiety and depression symptoms, which at both baseline and follow-up were in the normal range.

It was not possible to conclude from the results that CR was not successful at reducing depression and anxiety symptoms, as the absence of any effect being found between CR and depression and anxiety needs to be treated with caution due to the study being underpowered. However, other psychological variables in CR non-attenders were found to have a significant effect. On the BCRQ, patients who did not attend CR, perceived it to be less necessary than participants who attended CR. Percieving CR to be
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less necessary could be a reflection of cognitive dissonance, with patients adjusting their beliefs about the necessity of CR to fit with their behaviour of not attending CR (Festinger, 1957). Previous evidence has found that patients who believed their treatment to be necessary are more likely to attend CR (Cooper et al., 2007). Cooper et al. (2007) found patients who believed CR was necessary before starting a program were more likely to attend, whereas those patients who believe CR was not necessary were at a greater risk of not attending. Understanding the best way to change this belief is a question for future research.

Cardiac patients in this current study who perceived their condition as controllable and who felt they understood their condition were more likely to complete CR. Previous evidence has demonstrated patients who complete CR have an increase in perceived personal control of their heart disease (Janssen et al., 2013). The results of this current study provide further support that patients completing CR have more positive illness perceptions than those who drop out of CR. Interventions have been successful at modifying negative illness perceptions, a brief intervention that challenged patient’s illness perceptions about their recent MI was effective at altering patients illness perceptions, resulting in improved functional outcomes before attending CR (Petrie et al., 2002). A subsequent analysis of this dataset showed the effect of the intervention was associated with the degree the individual experienced negative affect (Cameron, Petrie, Ellis, Buick, & Weinman, 2004). By targeting such interventions either before or during CR may address low attendance and completion at CR by challenging perceptions that may act as barriers to participation and completion.
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Study limitations

A strength of this study was its longitudinal design, which enabled participants to be followed up after they had completed CR and offered the potential to examine whether CR was effective at reducing symptoms of depression and anxiety. With a longitudinal design, it was possible to explore whether illness perceptions and cardiac beliefs change over time and whether this change was different in those who attend CR. Despite these strengths, the study had some notable limitations, some of which were inevitable and some of which arose from the previously acknowledged challenges with recruitment.

This study did not randomly allocate participants into CR and a control group receiving only usual care, as the well-established benefits of participation would have rendered this unethical. Due to the low statistical power of the study, it is not possible to conclude that there was no effect between depression and anxiety and CR attendance or completion, only there was not enough power to demonstrate an effect. A further limitation of the small sample meant it was not possible to conduct some of the planned analyses which aimed to examine psychological outcomes for participants with elevated levels of depression and anxiety symptoms at baseline. As discussed in Chapter 3 this is a significant gap in the literature, which this study was unable to address.

Caution is required when attempting to generalise from the results of this study, as the sample in this study may not be representative of the wider population from which it was drawn. The findings from this study are based on a predominantly male sample from two hospital CR programs in the same health district in Australia. The sample of participants was not sufficiently large to observe the findings for men and women separately, which prevented any exploration of the impact of gender on the relationships being examined. The progression of heart disease is significantly different between women and men (Rollini et al., 2009), with women being less likely to attend CR than
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men (McGee et al., 1992). A further limitation was being unable to include people who did not speak fluent English, due to the level of English needed to complete the questionnaire. As with women, this is a group that is underrepresented in the current evidence base (Beswick et al., 2004; Johnson & Onwuegbuzie, 2004). The experience of CR among these subgroups merits further attention to ensure the possible differences in health care needs of all those recovering from heart disease are met. These issues could be more adequately addressed by recruiting a more heterogeneous sample, and possibly oversampling both women and people for whom English is a second language.

This sample may have been biased in recruiting patients who were planning on attending CR. It is possible that on receiving the questionnaire packs, patients that read the aims of the study, who were not planning on attending CR might have felt their participation in the study was not relevant. Therefore, it is possible that this study was not representative of patients who did not attend CR. To overcome this limitation in future research, it is suggested the patient information leaflets states the importance of the views of patients not planning to attend CR and this is emphasised in plain English to increase recruitment. Postal questionnaires were used for the recruitment of participants to this study. This method of data collection is a non-expensive mode of collecting patient data (Maxin, 1999). However, a major disadvantage of this method of data collection is non-responses and high attrition rates at follow-up. A limited improvement in recruitment was achieved by the researcher telephoning respondents to promote the study. A one-to-one invitation from the researcher with patients prior to being discharged from hospital could have been a more effective recruitment strategy, to increase participant numbers, had this been possible. Addressing these limitations may have increased participation from patients who did not attend CR.
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Research implications

Future studies should address the limitations from this study. The greatest limitation of this study was the recruitment and retention of participants. Recruiting large samples of participants who have recently had a cardiac event can be labour intensive, incurring a substantial demand on resources. To improve recruitment in future studies, members of the research team could identify possible participants before being discharged from hospital and approach them with a face-to-face invitation to participate. For future studies, it would be advisable to increase the number of recruiting hospitals involved. Recruitment of heart disease patients can be difficult, and to be able to consider all relevant variables linked to attendance and completion of CR can create very long and onerous questionnaires. Completion of long questionnaires can be a factor contributing to low response rates and a reason preventing patients participating in research.

A future research direction should focus on interventions to treat depression and anxiety that could run in tandem with CR programs, as it appears it cannot be assumed effective treatment of psychological distress is something that will resolve with standard care. There is a need for more high-quality RCTs or non-RCTs (if an RCT is not perceived to be suitable), exploring the effects of CR and additional psychological interventions. Targeting psychological interventions at patients with elevated levels of depression who attend CR, may prove to be an effective way of meeting the psychological needs of patients (Child, Sanders, Sigel, & Hunter, 2010). Future research should explore the effectiveness of using the contact between health professionals and patients with heart disease during CR as an opportunity to identify patients with elevated levels of depression and anxiety, who might benefit from a psychological intervention. This might be an effective way to treat cardiac patients with elevated levels of depression and anxiety, improve quality of life and reduced the risks of morbidity and mortality.
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Qualitative research design should be considered to explore the relationship between patients with elevated levels of depression and anxiety and their approach to recovery following a cardiac event. Interviews may be an effective way of utilising a smaller sample to obtain a greater understanding of the gaps that exist in current knowledge. Exploring interview data allows for a more in-depth exploration of how people make the decision to attend and complete CR and the effectiveness of CR at addressing depression and anxiety symptoms. Chapter 5 of this thesis uses qualitative methodology to examine the current gaps in knowledge. The mechanisms which psychological distress may impact the recovery from a cardiac event and attendance at CR are not entirely understood, and there are inconsistencies existing in the current literature. The lack of studies evaluating the effectiveness of CR to reduce symptoms of depression and anxiety in patients with borderline or clinical scores may be a reflection of the problem recruiting these participants. Exploring these issues through qualitative inquiry may be beneficial to the understanding of these patients.

Clinical implications

It would appear from the results of this study that the clinical implications are two-fold. Depression and anxiety symptoms do not appear to have much impact on successfully getting people to attend CR and CR itself does not guarantee improvements in anxiety and depression.

Attendance at CR in this study did not appear to improve anxiety and depression symptoms. However, as this study was underpowered it is not possible to conclude that CR is not effective at reducing depression and anxiety symptoms. The conclusions put forward in Chapter 3, which were based on studies of poor methodological quality; deemed it unlikely that CR is effective at reducing depression or anxiety symptoms.
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Without robust evidence it is not possible to determine the effectiveness of CR at reducing depression and anxiety symptoms, but as an intervention it is effective at reducing morbidity and mortality (Jolliffe et al., 2001; O’Connor et al., 1989; Rutledge et al., 2013; Taylor et al., 2004). Although CR is still an important intervention for cardiac patients to attend, for those with depression and anxiety an additional intervention could be beneficial. Evidence supports CR as an important intervention for all cardiac patients to attend for an optimal recovery after a cardiac event, but more robust evidence is needed to understand the best way to treat this subgroup of cardiac patients with elevated levels of depression and anxiety and to better understand the mechanisms that impact on the mortality and morbidity. Depression is predictive of post cardiac mortality, which suggests the importance of CR attendance for patients with depression.

It is important for health care professionals to be able to identify which patients are at a greater risk of not attending or completing CR. Barriers are presented in the literature to explain why patients do not attend CR. Not all of these barriers are related to patients; some are due to issues present within health care systems. How a healthcare system treats and provides services to patients who require extra services, not covered by CR programs, might not be generalisable from a population in South West Sydney, to the whole of Australia. It is even harder to generalise to a European and North American population as healthcare systems vary differently from country to country.

Conclusions

The findings from this study need to be treated with caution as there was not enough power to show an effect to answer the research aims of this study. It is not possible to conclude from the results that depression and anxiety symptoms did not affect CR attendance or completion or that CR did not reduce symptoms of depression or
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anxiety symptoms. Therefore, this study does not conclude that there was any
relationship between the variables measured, just that there was not enough power to
detect a relationship.

This study did find evidence to support a difference in both illness perceptions
and CR beliefs between those participants who attend and complete CR compared to
those that did not. Future studies could look at interventions to target changing both
patients’ illness perceptions and cardiac beliefs to improve attendance and completion of
CR. To understand how to treat depression and anxiety in cardiac patients effectively,
future high-quality studies, preferably RCTs could examine the benefits of alternative
interventions for reducing depression and anxiety in cardiac patients with elevated levels
of depression and anxiety symptoms. CR is a proven program for reducing mortality and
morbidity which all cardiac patients should attend, but patients with depression and
anxiety may benefit from an additional intervention designed to reduce their
psychological distress.
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Chapter 5 The role of psychological distress on CHD recovery and CR:
A Qualitative Study

The public burden of CHD is high regarding both the societal costs and at an individual level. For those who survive a cardiac event, there is a need to reduce the risk of future cardiac events and to improve quality of life. There is an increasing demand for successful interventions and rehabilitation for both a physical and emotional recovery. The previous chapter examined how the role of psychological distress affects a patient’s decision to attend and complete CR and whether there are psychological benefits of attending CR, using quantitative methods. This chapter uses qualitative methods to take a more in-depth look at the role of psychological distress in a cardiac patient’s recovery from a cardiac event and their decision to attend and complete CR.

Studies examining factors related to participation and non-participation in CR have explored and found many different variables affecting the decision-making process for recovery in cardiac patients (Kerins, McKee, & Bennett, 2011; O’Connell, 2009; Whitmarsh et al., 2003). Our understanding of the impact of psychological variables on cardiac patients has predominantly been acquired from studies employing a quantitative approach. The evidence attained from this approach has demonstrated the importance of both depression and anxiety on completion of CR (Swardfager et al., 2011) and the importance of illness perceptions and CR beliefs on the attendance at CR (Cooper et al., 2007; French et al., 2006). However, it is not clear what the mechanisms are between these variables and the roles they play in a cardiac patient’s recovery. To address this gap in knowledge, a qualitative approach may be able to capture the information quantitative scales cannot access. This method is more patient focused and allows for a deeper insight
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into the complex issues involved in the decisions patients make when considering CR attendance and the psychological benefits they may receive by attending CR.

The role of psychological distress on CR attendance and completions

After a cardiac event, some patients may have difficulty adjusting (Doiroin-Maillet and Meagher-Stewart, 2003). A cardiac event can cause participants to confront their mortality, and feel uncertain about their future (Doiroin-Maillet and Meagher-Stewart, 2002). These feelings of uncertainty can lead to depression and anxiety, which has important implications for a person’s recovery from a cardiac event. In quantitative studies, it has been demonstrated that cardiac patients with depression and anxiety have worse cardiac outcomes with an increase in mortality and morbidity (Bunker et al., 2003; Carney et al., 2009; Nicholson et al., 2006). In previous chapters evidence has been presented that demonstrates CR as an effective intervention for reducing the risks of mortality and morbidity and all cardiac patients are encouraged to attend (Rutledge et al., 2013). However, the effects of psychological distress have been found to be both a barrier and facilitator in attendance at CR (Glazer et al., 2002; O’Connell, 2009; Rieckmann et al., 2006; Whitmarsh et al., 2003). As discussed in Chapter 4, the role of psychological distress on attendance at CR is not clear. Depression has been found to be both a predictor (Glazer et al., 2002; Whitmarsh et al., 2003) and a non-predictor to CR attendance (Kronish et al., 2006; Lane et al., 2001; Tolmie et al., 2009). Depression as a predictor for non-completion of CR is more consistent than the evidence for the role of depression on CR attendance (Swardfager et al., 2011). However, from the available evidence, it is not possible to understand the role of depression and anxiety on how cardiac patients make decisions about their recovery and attending CR. By asking
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patients about their experiences it is hoped to gain a better understanding of the role depression and anxiety has on recovery.

Psychological distress can also impact the recovery from heart disease, not just through CR attendance and completion. It can also influence adherence to medication and a patient’s ability to make necessary lifestyle changes, for example changing diet, smoking cessation (Kronish et al., 2006) and becoming more physically active (Rogerson, Murphy, Bird, & Morris, 2012). Cardiac patients with depression and anxiety have worse cardiac outcomes (Frasure-Smith & Lespérance, 2008), however, the mechanisms which depression and anxiety affect cardiac outcomes are not well understood. Possible explanations offered include physiological and behavioural mechanisms, but whether these proposed mechanisms are correct has not been established. Understanding how psychological distress may act as either a barrier or a facilitator to a patient’s decision to attend CR and adopt lifestyle changes are essential for improving patient outcomes. By exploring whether these barriers and facilitators may differ between patients with and without high psychological distress after a cardiac event, may increase our understanding of how to develop interventions to reduce morbidity and mortality in patients most at risk.

The Impact of CR on psychological distress

CR is an effective intervention for reducing the risks of mortality and morbidity. However, it is unclear from the current evidence whether CR is a successful intervention for reducing depression and anxiety. Psychological interventions have had modest effects on reducing depression symptoms but not on reducing cardiac outcomes (Berkman et al., 2003; Glassman et al., 2002; Van Melle et al., 2007).
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Previous chapters in this thesis have discussed the important role of psychological distress in respect of heart disease. It is not clear from these studies how psychological distress may impact a patients’ decision about recovery and CR attendance. It is possible the role is more complicated and quantitative research is unable to unpack these complexities. Inquiry using a qualitative approach will enable a more in-depth understanding. In the literature, there is a paucity of qualitative research that has explored the role of psychological distress beyond the limitations of fixed response questionnaire design. It is important to understand how patients experience the psychological response to illness and how important the role of distress is to this adjustment.

Focus of previous qualitative studies

In recent years there has been only a handful of qualitative studies on CR. The primary foci of these studies have examined reasons for attendance (Hird, 2004) and non-attendance at CR (Jackson, McKinstry, Gregory, & Amos, 2012; Jones, Jolly, Raftery, Lip, & Greenfield, 2007); and patients CR beliefs (Cooper et al., 2005). A recent systematic review and meta-synthesis of qualitative studies exploring attendance at CR found numerous explanations for attendance and non-attendance at CR (Neubeck et al., 2011). These explanations included service and system level barriers, which focused on physician recommendation and misconceptions of CR; practical barriers, covering transportation and language issues; personal barriers, perceptions of heart disease and CR; and also specific issues that affect women and culturally and linguistically diverse (CALD) patients (Neubeck et al., 2011). The role of emotions in CR attendance was identified, with distress triggered by having a cardiac event resulting in a loss of confidence and denial. However, due to the lack of studies, the role of anxiety and depression in CR attendance was not addressed by this review.
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Qualitative research studies investigating how psychological distress may impact on patients’ decisions to attend CR and recovery are lacking from the current evidence. The qualitative evidence that exists on the topic of activities that promote recovery from CHD have focussed on the impact of depression on patients perceptions of heart disease (Simmonds, Tylee, Walters, & Rose, 2013) and physical activity (Rogerson et al., 2012). Simmonds et al., (2013) concluded patients with high psychological distress and CHD had a myriad of experiences and needs which involved both a social and personal sense of loss in light of their heart disease. The role of high psychological distress affects engagement in physical activity, acting as a barrier by influencing negative perception of physical activity (Rogerson et al., 2012). High psychological distress was also linked to other barriers; physical activity, including fear, lack of motivation and uncertainty (Rogerson et al., 2012). This documented relationship between depression and physical activity suggests that depression may also play a role in attendance at CR, given that physical activity is a major component. Therefore, exploring the relationship of how psychological distress may affect a cardiac patient’s decision to attend CR is pertinent in understanding how psychological distress influences their adjustment to recovery.

Aims

To my knowledge, this is the first study that aims to address this gap in the literature by exploring the role of psychological distress in a patients’ recovery from a cardiac event and how it influences the decision to attend CR. Interviews were conducted with cardiac patients who attended and did not attend CR. The aim of these interviews was to understand how psychological distress may have had an impact on the decision to attend CR, and whether attending CR could reduce psychological distress. To
understand the impact of psychological distress on CR attendance, this study took an in-depth exploration of potential barriers and facilitators.

Specifically, the aims of this study are:

i. How does psychological distress influence a participant’s decision to attend and complete CR, through an exploration of barriers and facilitators such as their understanding of the cause of their CHD and purpose of CR?

and

ii. Does CR have an impact on psychological distress?

Method

Ethical approval

The study was approved by the South Western Sydney Local Health District Human Research Ethics Committee Research Ethics Committee (reference HREC 12/067), and the University of Western Sydney ethics committee (reference H9856). All participants consented to take part in the study.

Participants and sampling

This study used a subset of participants in the quantitative study reported in Chapter 4. The recruitment pack sent to prospective participants (please refer to Chapter 4 for an explanation of the recruitment of participants), included a consent form and an invitation to take part in the qualitative component of the study. For participants to be eligible to be interviewed, they needed to have completed a six-month follow-up questionnaire and have given the researcher permission to contact them.

Using purposive (or theoretical) sampling (Mays and Pope, 1995), 14 participants were invited to take part in the qualitative component of the study. To enable a comparison between themes and to enable an examination of variation in how
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psychological distress affects the decision to attend CR, participants were selected to provide diversity in terms of whether they attended CR or not and whether they had elevated levels of depression or anxiety symptoms. Participants score on the Hospital and Anxiety Scale (HADS) (Zigmond & Snaith, 1983) at baseline was used to determine whether participants had elevated levels of depression and anxiety. Of the 14 participants approached, 13 (10 men, three women) agreed to be interviewed, and one male participant declined.

Interviews

Participant data was collected by either telephone or face-to-face interviews. A private room on the university campus was used to conduct all face-to-face interviews. A semi-structured interview (please see Appendix E for the interview schedule) was carried out using a topic prompt. The purpose of the semi-structured interview questions was to examine how cardiac patients make the decision to attend CR, by covering a range of topics. Initial questions were: “Can you tell me what you initially understood cardiac rehabilitation programs were all about?” “Can you tell me how you have been feeling emotionally since you had your heart attack (relevant condition)?” Participants were encouraged to talk freely and were redirected back if they deviated from the purpose of the interview. The progression of the interview varied by the follow-up questions needed to explore the initial question; these included, but were not limited to: “Can you describe that in more detail?” “Can you explain how that made you feel?” “What do you think about that?”

A digital recorder was used to record all interviews, and a commercial transcriber was used to professionally transcribe each interview verbatim. A confidentiality agreement was signed by the transcriber to protect the privacy of participants’ and a
secure process for the storage and transfer of all files used. Interviews lasted on average for an hour. All transcripts were read and checked by the researcher against the original voice file for accuracy. Confidentiality of participants was maintained at all times. All participant names were replaced with pseudonyms throughout all transcripts to ensure their anonymity.

**Data analysis**

The data was analysed thematically using constant comparison methods (Strauss and Corbin, 1998). NVivo 10 software was used to code all transcripts. Interview data was read and reread to gain an understanding of the data and to identify how participants approached their recovery and how they made their decision to either attend or not attend a CR program. An initial coding framework was developed. A list of initial themes was generated to code the data and expanded into emergent themes. The patterns of relationships between themes were considered. For themes, that overlapped they were examined and collapsed to develop main themes. The emerging results were continually evaluated throughout the analysis and writing.

To ensure coding was comprehensive and reliable a second researcher (KNP) independently cross-checked the coding with a random sample of interview transcripts (four interviews) against the coding framework. On completion of this task, the researchers reached consensus about the analysis, thus verifying the concurrence of the key themes identified.

Descriptive data for all participants interviewed came from the baseline and follow-up questionnaires referred to in more detail in Chapter 4. The descriptive data used included depression and anxiety status, type of heart disease, attendance/completion
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

of CR, age, marital status, education, employment status and history of anxiety and depression (Table 14).

Table 14

Characteristics of participants interviewed

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
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<tr>
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<tr>
<td>PCI</td>
<td>3</td>
</tr>
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<td>Retired</td>
<td>7</td>
</tr>
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</tr>
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<td>No</td>
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<tr>
<td>Did not attend</td>
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<td>Anxiety</td>
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<td>Normal range</td>
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<td>Borderline</td>
<td>4</td>
</tr>
<tr>
<td>Clinical anxiety</td>
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</table>

Participant characteristics

Overall there were thirteen participants included in this study, ten men and three women (see Table 15). All participants self-reported experiencing a heart attack which involved a stay in hospital. Eight participants attended CR, and five did not.
### ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

#### Table 15

Participants

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Age</th>
<th>Self-report Cardiac Event</th>
<th>Married Status</th>
<th>Attended CR/</th>
<th>Employment</th>
<th>Smoking Status</th>
<th>Family history of CHD</th>
<th>History Of dep/anx</th>
<th>HADS Dep</th>
<th>HADS Anx</th>
<th>FU HADS dep</th>
<th>FU HADS anx</th>
<th>BMI (baseline)</th>
<th>FU BMI</th>
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<tr>
<td>Males</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>Yes**</td>
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## ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

<table>
<thead>
<tr>
<th>Females</th>
<th>Age</th>
<th>Self-report Cardio Event</th>
<th>Married Status</th>
<th>Attended CR/ Employment</th>
<th>Smoking Status</th>
<th>Family history of CHD</th>
<th>History of dep/anx</th>
<th>HADS Dep</th>
<th>HADS Anx</th>
<th>FU HADS dep</th>
<th>FU HADS anx</th>
<th>BMI (baseline)</th>
<th>FU BMI</th>
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<td>-</td>
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<td>-</td>
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<td>Normal</td>
<td>Clinical</td>
<td>Normal</td>
<td>34.48</td>
<td>33.27</td>
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CABG = Coronary artery bypass graph surgery, FU = follow-up, PCI = Percutaneous coronary intervention

*Being treated for depression/anxiety since heart attack  **

Information given in questionnaire differs from the information given in the interviews  ***Completed 100% of the education sessions, but none of the exercise sessions
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Depression and anxiety scores of participants

**Baseline depression and anxiety scores.** Based on HADS scores at baseline, two participants (Jim and Joe) had a HADS score indicating both borderline depression and anxiety. Of these two participants, one attended CR and did not complete CR (Jim), and the other participant never attended CR (Joe). Three participants (Matthew, Maurice, and Martha) had scores indicating clinical anxiety. Of these three participants all attended CR, but Matthew dropped out after the first session. All of the other eight participants (Alfie, Bob, Dave Frank, Stan, John, Mandy and Anne) had scores at baseline in the normal range. Of these eight, five attended CR (Alfie, Bob, Dave, Frank, and Stan), but Frank dropped out due to ill health, and three participants did not attend CR (John, Mandy, and Anne).

**Follow up depression and anxiety scores.** At follow-up two participant’s scores for anxiety reduced from clinical to borderline anxiety (Martha and Maurice). One of these participant’s depression scores increased from being in the normal range to borderline (Maurice). One participant saw no change in their score for anxiety (Matthew) and another participant’s depression score remained the same and their score for anxiety increased into the clinical range (Jim). One participant had a HADS score indicating borderline anxiety (Mandy), and she did not attend CR. All other participants at follow-up had scores within the range for normal at follow-up.
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Table 16

Themes and subthemes used

<table>
<thead>
<tr>
<th>Themes</th>
<th>Sub-themes</th>
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<tr>
<td>Beliefs about the causes of heart disease</td>
<td>Causes of cardiac event</td>
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<tr>
<td></td>
<td>What a relief?</td>
</tr>
<tr>
<td>Treatment</td>
<td>Initial perceptions/thoughts about CR</td>
</tr>
<tr>
<td></td>
<td>Facilitators/barriers for attendance at CR</td>
</tr>
<tr>
<td></td>
<td>Need to be fixed</td>
</tr>
<tr>
<td></td>
<td>CR and psychological distress</td>
</tr>
<tr>
<td></td>
<td>The role of psychological distress on completion</td>
</tr>
<tr>
<td>Response to heart disease</td>
<td>Life response shift – taking control</td>
</tr>
<tr>
<td></td>
<td>Psychological distress and perceptions in recovery</td>
</tr>
</tbody>
</table>

Three themes with subthemes (see Table 16) were developed for the purpose of understanding how cardiac patients make the decision to attend and complete CR and to explore whether attending CR can reduce symptoms of depression and anxiety.

**Beliefs about the causes of heart disease**

The first theme was interested in understanding how psychological distress may interact with participant’s perceptions about the causes of their cardiac event. It also
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explores patients’ perceptions of the causes of their cardiac event and how this perception may influence their decision to attend CR.

Causes of the cardiac event. Many participants believe there is an important relationship between their mental health and their cardiac event. All participants with elevated levels of anxiety and depression at baseline believe the cardiac event is the result of stress (Joe, Martha, Mandy, Jim, Maurice). Martha talks about the stress she was experiencing before her heart attack while helping her daughter look after her grandson:

“my heart attack, was the stress of, looking after [grandson]. We were looking after him four days a week last year by helping my daughter, ... It was really hard. She couldn't drive; I was driving her. I had to be up, you know, at 6.30 in the morning to take her to work and all different shifts and things. So I guess I've been managing with her and so a lot of stress, a lot of driving, a lot of family stress and everything.” (Martha, 61 years)

Stress as a cause for participants’ cardiac events was not isolated to only participants with elevated scores for depression and anxiety, but also for participants with scores in the normal range (Anne, Bob, Dave, Alfie). Most participants believed not one cause was responsible for their cardiac event and accepted their lifestyle was also a contributory factor, as was having a family history of heart disease (Dave, Alfie, Martha, Joe, Jim, Mandy, and Maurice). However, many participants who cited a family history as being a possible cause did not make this link until after having a cardiac event and
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therefore did not make any changes to their lifestyle to try to prevent a cardiac event. Participants perceptions of what caused their cardiac event appears mixed. Nearly all participants perceive lifestyle changes to be an acceptable and a needed approach to their recovery.

For Joe with a score indicating borderline depression at baseline, he believes the cause of his heart disease was job stress, an unhealthy lifestyle and a family history of heart disease with most males in his family having had a heart condition. He acknowledges denying the risks to himself, “I think, I have always just stuck my head in the ground like a proverbial emu, and said, “I’ll be right.”” Joe believes he had no control over his cardiac event. Instead, this control appears to be external to him. He believes a heart attack was an inevitable event. This passivity about his cardiac event is reflected in his approach to recovery. He wants to attend CR but is unable to attend as the program is full. When asked about whether he has made any changes to his lifestyle he responds by saying he will start exercising and start a diet “next Monday”:

“We will go shopping. We will start that diet. …I will buy what I need to exercise with, And if I don’t make that commitment now, well, it will probably never happen.” (Joe, 64 years)

What a relief? Participants with scores in the normal, borderline and clinical range on the HADS, recount having very stressful lives before their cardiac event (Anne, Bob, Dave, Jim, Martha, Maurice, Matthew, Mandy). For Dave and Bob, they feel
having a cardiac event was a type of physical relief. For Bob who was suffering much stress at work before his cardiac event recalls how:

“I said to my mate in hospital.... when he came and see me. I said, "It's hard to explain.” I said, "All of a sudden I feel a lot better, the day after - day after I had the heart attack." I said you can see a weight's been lifted off my shoulders. Can't really explain why.” (Bob, 51yrs)

Dave believes the cause of his cardiac event was stress and how having the cardiac event caused some relief. “I think because I was stressing before the heart attack I think I needed it and I – I needed the break.” Dave (68years)

Despite perceiving the cardiac event as being caused by stress, the physical release of this stress described by both Dave and Bob did not prevent them from attending CR. Both Dave and Bob attended CR to help with their recovery, as they believed changes needed to be made to both their lifestyle and how they managed stress.

**Treatment**

Psychological distress had both a positive and negative effect on how participants made decisions about their treatment, acting as a facilitator for some participants and a barrier for others. All participants except one (John) remember receiving either verbal or written information about CR while in hospital.

**Initial perceptions/thoughts about CR.** John, whose HADS score was in the
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normal range, did not understand what CR was when asked, nor did he understand the relevance of the program. All other participants with a HADS score in the normal range had a positive view of CR programs. They perceived CR as a program to help them understand their illness, help change their lifestyle and offer some much needed support to get their health back ‘on track.’

Alfie thought CR:

“would help me understand better what ... I was going through and how that could help me get through everything, because I wanted to do, as much as I could that was right and not do the wrong thing.” (Alfie, 62 years)

Despite this initial perception of CR being a program to help participants with their recovery from a cardiac event, there was a lack of understanding of what a CR program would involve, which left some participants apprehensive. Bob initially was not keen to attend, being only 51 years of age and not having had a “major heart attack” he thought CR would “be like a lot of people sitting around ….a circle and chairs…Getting up and saying” and he thought “maybe it’s not for me.”

Participants with HADS scores indicating elevated levels of depression and anxiety symptoms at baseline (Martha, Maurice, Jim, Joe), also viewed CR as a program to help with their recovery from a cardiac event. There were also some misconceptions about what attending CR would involve. Maurice thought CR “was something that was negative.” He was concerned about the exercise component, “I was thinking maybe they
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wanted to see, like, how far I could push myself before I could, like, not breathe. Or – or
– or get more pains, or whatever.” He was initially concerned about the exercise
component of a CR program believing CR staff would see “how long you could do it
[exercise] before you get, like – like, another heart attack, I – I guess.”

Only Matthew, whose score on the HADS indicated clinical anxiety, initially
perceived CR as not conducive to his recovery. Matthew believes his cardiac problem has
not been “fixed.” At both baseline and follow-up, Matthew has a score indicating clinical
anxiety. This cardiac event is Matthew’s second; twenty years earlier he underwent a
triple heart bypass. He reports his cardiologist is now treating the blockages in the heart
grafts with medication, whereas Matthew believes he should be having his blocked grafts
replaced. Matthew believes CR cannot help him. When asked what his initial thoughts
are on CR he replies:

“there was the usual paraphernalia given to you about heart health and all that
stuff, um, which I considered to be a bit of a misnomer. If we had two blocked
arteries and I’d done the right thing in the past with dietary stuff and exercise, I
thought, well, hang on, we’re kidding ourselves here. Um, I can go and run
around the block, it’s not going to bloody help anything. We really have a - a
blockage issue that’s got to be addressed. And we normally have three – three
arteries keeping the heart supplied and now we’ve got one, so, how do we fix the
other two?” Matthew (61 years).
Facilitators/barriers for attendance at CR. Receiving a phone call facilitated CR attendance. The participants who attended CR whatever their initial thoughts or doubts were about CR, whether they had depression or anxiety scores within the normal, borderline or clinically range, all received a telephone call from CR services, booking them into a program. The only exception was Martha who at baseline had an anxiety score in the clinical range. Martha, when visiting her cardiologist for a regular appointment, said she was interested in attending CR, and her cardiologist made the necessary arrangements. In these instances, where participants received a phone call from CR services or had CR sessions arranged by a cardiologist, these actions by health professionals facilitated CR attendance.

Factors raised as potential barriers, included concerns about transport and CR not being a priority. Stan was concerned about the practicalities of getting to CR. As the hospital, he attended provided transport, this barrier for him was removed. For Alfie CR initially took “a back seat.” When he received a call from the CR program coordinator, he accepted the invitation and started to attend the sessions. By telephoning people to make the first appointment to attend CR and providing transport, CR services reduced the number of barriers for cardiac patients.

Not receiving a telephone call from CR services was a barrier for CR attendance. For these participants who did not receive a phone call (Anne, Joe, and Mandy) psychological distress did not appear to impact CR attendance, instead, the barriers
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identified by the participants seemed to be associated with variations in health service delivery. Anne, Joe and Mandy all indicated being interested in attending CR. Both Joe and Anne wanted to attend and contacted the CR services themselves, but the barriers they faced were not a result of their lack of motivation, but a result of them being unable to join a program. Joe was told there was a waiting list, and Anne’s calls to CR were never returned. Mandy thought she would like to attend CR, but she did not understand whether she was eligible to attend, “I didn’t [attend] because I didn’t know I could attend or not attend.” Despite wanting to attend, these three participants did not attend a single session of CR.

John was the only exception. John remembers receiving a telephone call from CR services, but did not fully understand the services being offered to him, recalling “I should have paid more attention to that but I didn’t pay attention that much.”

Need to be fixed. Matthew, with anxiety scores in the range for clinical anxiety at baseline, believes he has not been fixed. Matthew believes his recovery is not about changing his lifestyle but instead is about being “fixed.” As he needs to be “fixed” he is avoiding making any necessary lifestyle changes.

Participants with scores for both depression and anxiety in the normal range, discuss feeling like they have been “fixed.” Although heart disease is a chronic disease, many patients view the treatment for their cardiac event as being “fixed.” These feelings of being fixed help them feel more positive about their heart disease and their ability to
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exercise. Some participants discuss not worrying as much as they did before their cardiac event due to feeling they have been “fixed.” Dave believes:

“I think I've become more positive now that I'm not working and this [his heart] has been fixed.....the bypass, has taken a lot of worry off me because I know now that body wise, I feel pretty fit”. (Dave, 68 years)

**CR and psychological distress.** At baseline, five participants’ had HADS scores indicating either borderline depression or clinical anxiety. Four of these participants attended CR. Among these CR attenders, a reduction in anxiety symptoms from clinical to borderline is reported in both Martha and Maurice at follow-up. Maurice’s HADS score for depression increased very slightly to borderline (a one point increase from baseline). He talks about being happy with the lifestyle changes he has made and feeling much fitter than before. However, he talks about being “moody” since his cardiac event. He recalls since his cardiac event he has not received any information on psychological well-being which he believes would have been helpful. Martha is the only participant with an elevated baseline HADS score to see a psychologist. At the time of the interview, there was much change happening in Martha’s life. She has nearly completed her CR program. Martha is concerned about how she is going to cope when CR ends. At the time of her interview, she is trying to make plans to find other services that could help support her recovery. This uncertainty is concerning her. Martha and Maurice both have a reduction in their anxiety scores at follow-up. However, at follow-up, their anxiety
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scores are in the borderline range.

Matthew’s score for anxiety on the HADS remains in the clinical range at both baseline and follow-up. Jim’s anxiety score increased from borderline anxiety to clinical anxiety at follow-up and his depression score remains borderline. Jim is coping with his recovery by avoiding seeking help for the pain he is experiencing. He fears the pain might be another heart attack. He does not want to go back into hospital as he is worried he might lose his job. Jim has noticed he is feeling more ‘down’ since having his cardiac event:

“Ah, well probably a bit more down since I’ve had it ‘cause I know that there’s a lot of things I can’t do anymore and I want to be able to do it and then you’re not game to do something. So it’s always in the back of your mind can I and can’t I. So it’s sort of a bit depressing.” (Jim, 54 years)

The role of psychological distress on completion. Only three participants who start CR fail to complete the program. Frank, with a HADS score in the normal range, failed to complete CR after returning to hospital. Once discharged he was unable to motivate himself to return to CR. Matthew and Jim, both with anxiety and depression, also fail to complete CR. They both believe CR is not relevant or necessary for their recovery. Jim dropped out of CR after attending six sessions, “to me it just sort of felt like a waste of time going there ‘cause I could do all these sort of things [exercise] at home.” Matthew believes CR is irrelevant, as he believes the solution to his health
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problem is a surgical one. Both are avoiding seeking help and reassurance for what they are experiencing. They both fear losing their jobs. As a result, their jobs are taking priority over their recovery from a cardiac event:

“secure in a job then we, can deal with the body and start getting that sorted”.

“not that it scares me per se but it’s time off work, it’s a very difficult time at work” (Matthew, 61, years)

All other participants who start CR, complete CR regardless of HADS score at baseline. Martha and Maurice at baseline both had scores indicating clinical anxiety. A common theme throughout both their interviews is a need to understand their heart disease and both need reassurance about their recovery. Martha is happy to attend CR and approached her cardiologist about attending. She needed help to make the necessary lifestyle changes, something she was worried she could not do on her own. She talks about finding CR supportive, meeting people in a similar situation to her. Being with people who have also experienced a cardiac event makes her feel less isolated and more reassured. Martha did not have the confidence that she could make all the necessary changes to her lifestyle on her own.

Maurice was worried and needed reassurance about the symptoms he was experiencing. Maurice, after leaving hospital, was concerned with every pain he felt and as a result, “I went back to the hospital, maybe three times because I had pains.” He attended CR because he felt it was something he had to do, to understand what was
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happening to him. He felt he had to attend CR to learn about his heart disease and because he was scared he could have another cardiac event. Once he started the sessions he felt he needed to keep attending so he would not lose motivation to continue to make the necessary lifestyle changes.

Anxiety symptoms acted as a facilitator for attending CR for both Martha and Maurice. A need to understand what they were experiencing and reassurance was a common theme amongst participants who attended CR regardless of their scores on the HADS. After having a cardiac event, participants frequently commented on not fully understanding what they needed to do for their recovery (Bob, Alfie, Stan and Dave). Participants perceived attending CR as both educating and assisting their recovery. They needed to be reassured about their physical symptoms and needed help making the necessary lifestyle changes.

“we fixed your heart not your head” – barriers and facilitators to psychological recovery. Making lifestyle changes can be difficult and overwhelming for patients. Referring patients to a psychologist can help them adjust after a cardiac event. Three participants (Alfie, Bob, Martha) were referred to a psychologist through CR services. The reasons for referrals included coping with anger, dealing with work stress and being overwhelmed by lifestyle changes. Bob and Alfie, at baseline and follow-up, had HADS scores in the normal range, but both were referred to a psychologist. No participant had requested to see a psychologist and all referrals were through CR.
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After leaving hospital, Alfie was not coping very well, and he had become very intolerant, “there is so much that goes on in your body and in your head– you need all the help you can get.” Alfie found his sessions with a psychologist beneficial, although he would not have asked to see one himself “because I didn’t know what the problem was.” Martha was overwhelmed by monitoring her diet and the changes she needed to make to her lifestyle. Martha found talking to a psychologist to be essential to her recovery, giving her the confidence to make the necessary changes and develop coping strategies for the future. For each of these three participants, seeing a psychologist facilitated their recovery from a cardiac event by teaching them strategies to overcome the difficulties they were facing.

Only one participant was seeing a psychologist before having a cardiac event (Joe). Joe was referred to a psychologist just before his heart attack as a result of work stress which saw him take early retirement. Joe only saw the psychologist before having a cardiac event and felt he did not need any more sessions. Joe’s HADS score at baseline indicated borderline depression but at follow-up was in the range for normal.

Matthew and Jim are both struggling with their recovery and both participants HADS scores either remained the same or increased at follow-up. Both Jim and Matthew recognise they are feeling depressed, but neither believe seeing a psychologist would help. Seeing a psychologist was not offered to Jim, and he is not convinced this would have helped, “I’d probably go and talk to someone and end up coming back and feeling
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the same anyway”. Matthew’s GP was keen for him to talk to a psychologist, but Matthew did not believe this would be of any help. On seeing a psychologist Matthew states:

“[I] don’t like to admit it but, yeah I think the black dog was nipping at the heels and, GP offered the – he said, ”Do you want, to see a psychologist?” And I said, ”What – what’s that going to do?” having been bitten once before by a psychologist, with no result, I thought no. We’ll just monitor it.” (Matthew, 61 years)

Response to heart disease

In exploring the aims of this study, a separate unexpected theme started developing from the data. When participants discussed how they made the decision to either attend CR or not, many of them went on to describe how they responded to having a cardiac event. Participants were mostly aware of the changes they needed to make to their lifestyles. For some participants, this meant breaking some lifetime habits. Making this commitment to their recovery saw participants respond to the challenge differently. Some participants adopted a very proactive response whereas others were yet to start the changes and were responding reactively.

Life response shift – taking control. For some participants having a cardiac event had caused them to re-evaluate their life and their health, and in doing so, they had had a proactive response to their illness by taking control of their recovery. For some this
re-evaluation of life had involved stopping smoking, drinking, eating junk food and
taking regular exercise. The motivation for making these lifestyle changes was a desire
to live to old age. Attending and participating in CR had enabled participants to
understand what they could do to regain control and live a longer healthier life. The first
step was to attend CR:

“I should go to some sort of rehab, to make myself better and make me aware of
how I can still lead a good, active life, sort of thing. And you know, don’t feel so
down that you had a heart problem. Just get over it, sort of thing.” (Stan, 57
years)

A cardiac event is an experience which had allowed some participants space to
grow personally. The heart disease had forced a positive change in their lives. They felt
fitter, stronger and more positive. The recovery from their cardiac event was not about
getting back to where they were but to transform them into something better.

Stan, “So I’m glad that I’ve had the heart problem, and fixed myself up. And you
know. Another lease on life sort of thing.” Alfie wants to be around to see his
granddaughter grow up, “it’s small little sacrifices that are well worth it – far better than
the alternative.”

Since having a cardiac event, Alfie has experienced a change in his tolerance
which initially increased his aggressive behaviour. Alfie saw a psychologist to address
his issues with aggression and intolerance. Alfie now has a new philosophy and believes
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life is too short to tolerate selfish people and idiots. He now tries to actively avoid negative people, which he views as a positive approach:

“My tolerance level has dropped. I’m not tolerant at all with people and I’ve never been like that. I’ve never – I’ve just sort of, don’t worry about it, you know, but now because it’s so important to me having a second chance, that well I haven’t got time for idiots.” (Alfie, 62 years)

Participants who reported a proactive response to recovery attended CR and had HADS scores in the normal range at both baseline and follow-up. Matthew did not have a proactive response to his recovery; he has reacted to his cardiac event by not taking control of his recovery. Matthew’s process of dealing with his illness has stalled; he has handed over his recovery to the hospital and is waiting for them to come up with a better treatment for his blocked grafts other than just giving him medication. Until this day happens he is just going to continue “stress eating and drinking,” and not doing any exercise due to the fear of having another heart attack as he is “only running on one artery.” He knows he is putting on weight, but he does not see his stress eating or drinking as a risk factor, rather something that is temporary and in response to stress.
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Fear and recovery. A common theme when participants were talking about their recovery was feeling fear. Fear was commonly mentioned in response to experiencing physical symptoms and was reported as a facilitator and a barrier to recovery.

Attending CR and talking in a group about the experiences and sensations they had with regards to pain, breathlessness and ‘every murmur’, normalised the experience for many and reduced some of the anxiety resulting from experiencing these symptoms. The fear of having another cardiac event was a common fear among participants who attended CR. For many, feeling pain or other physical symptoms increased this fear, but attending CR helped alleviate this by reassuring participants that what they were experiencing was normal.

Not everyone was so positive in regards to their health post cardiac event. Anne feels worse after her cardiac event, “[I’m] definitely not the same as I was”. Some days I have lots of energy, and I might have energy for a few days, and then I might have to stop for a couple of days, probably because I make the most of the energy while it’s there and that might not be a good thing to do.” John too talks about how he has slowed down.

Jim still experiences a lot of pain, “it’s just like we’ve had the operation again.” Since having his cardiac event, he has found a good job and is earning good money. His job is very physical, involving a lot of lifting and bending. He fears the pain he is experiencing could be another heart attack. He is worried if he had another heart attack he would lose his job. He is hesitant and avoids going to see his GP as he does not want
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to go back to hospital and not be able to work. For Jim, there is no reassurance in attending CR, the primary focus for his recovery is about being able to stay working.

Matthew also feels worse both physically and emotionally since his cardiac event. For Mandy who did not attend CR, and Matthew and Jim who dropped out of CR, they all fear having another cardiac event. All three had HADS score that either increased or remained in the clinical range at follow-up. Matthew feels he has not been fixed properly. Jim is still suffering lots of pain and is unsure whether the chest pain is the result of his surgery or the signs of another heart attack. Joe, who never attended CR and Matthew who dropped out of CR, do not exercise for this very reason, as they experience physical symptoms, such as pains in the chest when trying to exercise.

**Discussion**

The aim of this study was to explore the impact of psychological distress on how patients make the decision to attend and complete CR and whether attending CR can reduce symptoms of psychological distress. Semi-structured interviews were used to understand how psychological distress influences recovery from a cardiac event, paying particular attention to how psychological distress may act as a barrier and a facilitator to CR attendance. Receiving a telephone call from CR staff inviting participants to attend was an effective facilitator to CR attendance. The role of psychological distress was involved in the completion of CR and how participants approached their recovery.
Psychological distress and CR attendance

The role of patient’s psychological distress does not appear to have influenced the initial decision to attend CR. Receiving a telephone invitation from CR appears to have been the most effective facilitator to CR attendance and not receiving a telephone call seems to have been an important barrier for non-attendance.

All but one of the participants included in this study had heard of CR and had a general awareness of what the purpose of CR was in the recovery from a cardiac event. There was a lack of knowledge about what was included in the actual content of a CR program, and as a result, it was not clear what participants could expect if they attended. Any misconceptions or indecision seems to have been removed by this simple service provided by CR staff.

Possible barriers to CR attendance identified from the participant’s interviews were consistent with barriers previously identified in the literature. Barriers raised by participants in this study consistent with current evidence include transportation issues (Daly et al., 2002), feeling uncomfortable in a group format (Farley, 2003), concerns about the exercise component of CR (Cooper et al., 2005), and perceiving CR as not being necessary (Cooper et al., 2007). Indeed a systematic review cited physician referral as the biggest predictor for attendance at CR (Jackson, Leclerc, Erskine, & Linden, 2005). In this current study, these barriers and apprehensions about attending CR appeared to have been overcome by patients’ receiving a telephone call inviting them to
In previous quantitative studies, not knowing what to expect from attending CR was presented as a barrier to attendance (Tod, Lacey, & McNeill, 2002). In this study, although participants discussed some concerns about what to expect from attending a CR program, it was not considered important enough to be a barrier.

Depression and anxiety symptoms did not affect the decision to attend CR for patients in this sample. By only examining the quantitative results in Chapter 4 it would not have been possible to conclude that receiving a telephone invite to attend CR facilitated CR attendance as this was not a question included in the questionnaire. Receiving a telephone call predicted CR attendance and is an important finding that would have been missed if this study was conducted using questionnaires only. Participants being asked to attend CR meant they did not have to take the initiative, reducing behaviours associated with depression and anxiety symptoms, such as avoidance and lack of motivation.

Previous quantitative evidence exists to support the role of depression and anxiety as both a predictor and non-predictor of CR attendance (e.g., Lane et al., 2001; Whitmarsh et al., 2003). The inconsistencies in the results between studies may be due to the different delivery of CR services between studies rather than the role of depression and anxiety.
Being invited to attend CR was a successful facilitator for getting cardiac patients to attend CR initially. It is noteworthy that a participant with a HADS score in the range for clinical anxiety at baseline approached her cardiologist about attending CR. This participant feared she would not be able to make the necessary lifestyle changes on her own and believed she needed the support of CR for her recovery. This suggests that anxiety may act as a facilitator for CR attendance.

However, getting patients to attend CR is only part of the issue. Preventing people from dropping out of CR is also an important consideration for CR services. It is estimated that many people do not complete CR programs. Drop out has been reported to be high in patients who experience depression and anxiety (McGrady et al., 2009). Of the three participants in this study who dropped out, two had anxiety scores in the clinical range, and one dropped out due after returning to hospital for a cardiac-related problem.

Common reasons presented in the literature for not completing CR are ill health, experiencing another cardiac event, depression (Swardfager et al., 2011) and elevated levels of anxiety (McGrady et al., 2009). Reasons presented in the literature for patients with elevated levels of anxiety and depression not completing CR have included reporting more physical symptoms and ill health. In this current study, the two participants with anxiety who did not complete CR reported experiencing an increased number of physical symptoms than other participants that attended CR. This finding is consistent with the evidence that patients with depression or anxiety symptoms had an
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increased likelihood of dropping out of CR, but patients with anxiety, as opposed to depression, dropped out much earlier (McGrady et al., 2009). Early drop out due to anxiety is particularly relevant to Matthew who only attended one session of CR, and before attending this one session believed CR could not help him. The risk of early drop out posed by patients with elevated levels of anxiety suggests a need for CR services to identify patients with depression and anxiety as early as possible in CR to prevent drop out.

In this current study, the role of anxiety symptoms acted as both a facilitator and a barrier to CR completion. Anxiety appears to have a dual role in the recovery after a cardiac event in this sample for participants with a HADS score within the range for clinical anxiety. For those who completed CR with baseline HADS scores indicating clinical anxiety, these patients needed reassurance and support. They needed reassurance for the symptoms they were experiencing, and they needed support to help them through their recovery, whereas for those participants’ with a HADS score in the range for clinical anxiety that dropped out of CR, anxiety was associated with avoidance behaviour.

There is a paucity of research that has examined whether anxiety may increase adherence to CR. However, there is evidence to support anxiety as being protective against recurrent events. Previous evidence has found that cardiac patients with GAD had greater improvements in cardiac outcomes compared to those with other anxiety
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conditions (Parker, Owen, Brotchie, & Hyett, 2010). The authors concluded that “apprehensive worrying” was constructive in improving participant’s self-management skills in treating their heart disease. They reported that worrying was constructive for adhering to medications and visiting a general practitioner (Parker, Hyett, Hadzi-Pavlovic, Brotchie, & Walsh, 2011). However, these findings did not support ACS patients with GAD visiting their health care provider or joining CR any more than non-GAD patients. Despite these conclusions stating the possible positive effects of worrying on a cardiac patient’s approach to recovery, there is more evidence to support anxiety as having a negative impact on behaviour in cardiac patients. Anxiety in this current study acted as a barrier to recovery through avoidance of help-seeking behaviour and a perception of not having control over treatment. One participant believed he had not ‘been fixed’, and for him, there was a sense of not having control over his heart disease or recovery. Lower perceived personal control has been linked with both elevated levels of depression and anxiety (Grace et al., 2005; Hermele et al., 2007; Stafford et al., 2009).

In the Heart and Soul Study, participants with GAD were found to report more smoking, less physical activity and less adherence to medications (Martens et al., 2010). Compared to depression there is not as much evidence to support the role of anxiety in the recovery from CHD. This current study did not observe GAD and was reporting only on anxiety symptoms, however, examining the role of how anxiety symptoms may have a positive role on behaviour in cardiac patients may be an important line of inquiry to follow.
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This response is consistent with a key component of the CS-SRM (Leventhal, Meyer, & Nerenz, 1980). The individual’s emotional response to the illness threat is coping by reappraising the information they are receiving to adapt to their illness. This response results in the participant being sufficiently motivated to follow advice and treatment. From a theoretical perspective, Matthew’s approach to his illness has stalled, he is not coping by reappraising information to adapt to his illness, he has strong beliefs that he is not receiving the correct treatment, but he is not seeking any help to address these issues. As a result, he is not motivated to attend CR and follow advice about behavioural change.

Not asking for psychological help

A common theme amongst participants, being treated for either depression or anxiety, was not realising themselves that this was something that needed treating, despite many reporting stress as one of the causes of their cardiac event. Instead, their anxiety and depression was identified by a member of the CR team. Participants failure to identify their own psychological distress highlights the benefits of screening all cardiac patients for depression, as recommended by the American Heart Foundation (Lichtman et al., 2008). A report, found only half of cardiologists treat depression in their patients (Feinstein et al., 2006). Physicians tend to link chronic diseases, such as heart disease with anxiety and depression, in doing this it can make depression and anxiety seem like a
normal part of the experience of living with a chronic disease and therefore making it more difficult for a patient to recognise they have a separate condition for which they should seek additional treatment (Dejean, Giacomini, Vanstone, & Brundisini, 2013). If patients are unaware that they are experiencing depression and anxiety, screening them would be a worthwhile activity to maximise the likelihood that those at risk obtain treatment.

**Attending CR with psychological distress**

Of the participants who completed CR, two had elevated levels of anxiety at baseline. At follow-up, both these participants reported a reduction in their anxiety scores from clinical to borderline. Both participants indicated they attended CR as they needed reassurance and support. Although both these participants saw a reduction in their anxiety levels after attending a CR program, it is not possible to conclude this was a direct result of attending CR or other variables not addressed in the interviews. This observation should be treated with caution as it is based on only two participants. However, it is possible that certain symptoms of anxiety could be reduced by attending CR. CR has elements that can address patient concerns. As demonstrated by Martha, attending CR provided her with the necessary support and reassurance she needed in her recovery from a cardiac event. This finding is based on participants with scores for anxiety in the clinical range. Previous review papers examining the effectiveness of psychological interventions for cardiac patients have commented on the small number of
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studies that have targeted interventions on clinically depressed and anxious populations (Rutledge et al., 2013; Whalley et al., 2012). It is not possible to report on the effectiveness of CR at reducing either anxiety or depression from this qualitative data, but it does suggest that there are components of a CR program that are conducive to reassuring and supporting people with certain anxiety symptoms.

Philosophy of illness/response to illness

Some participants had not made the necessary changes to their lifestyle, whereas other participants’ response to having a cardiac event had allowed them to re-evaluate their lives. This response is consistent with the observation that individuals can experience a positive psychological change as the result of a struggle with a stressful life event (Tedeschi, Calhoun, & Taylor, 2004). This positive change had resulted in participants adopting a very proactive response to their recovery from their heart disease. These participants reported feeling more in control of their recovery and feeling less pain and other symptoms. AMI patients with a less negative perception of illness symptoms respond considerably more quickly to treatment than patients with a more negative perception of their illness symptoms (Johnson & King, 1995). They differed from other participants in their approach to their recovery in that they have experienced post-traumatic growth (PTG) (Tedeschi et al., 2004). Very few studies have explored PTG in cardiac samples. What this adds to our understanding is these participants have re-evaluated their life in response to their illness threat, and as a result, they are thriving
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with the changes they have made (Hefferon, Grealy, & Mutrie, 2009). By identifying the positive ways in which these cardiac patients have changed their lives and approached their recovery it may be possible to understand the means to improve outcomes for all cardiac patients. This positive response is in contrast to the participants who are not proactive in their recovery and are instead just reacting to their heart disease by not taking control and being avoidant of making necessary lifestyle changes. It would be an interesting future direction of inquiry to understand and explore further participants who have managed to adopt a proactive response to their recovery and whether there are any lessons from their approach that could be applied to assist those who are struggling to respond.

Research limitations

A strength of this study was its use of semi-structured interviews that allowed participants to raise a broad range of issues about how they made decisions around participation and completion of CR, and the impact of CR on psychological distress. The rich data obtained from these interviews allowed for a deeper and original insight into how psychological distress impacts this recovery, without the constraints of fixed response options typical of quantitative studies.

However, this study did have some limitations. The number of CR non-attenders was low, and this may reflect a bias in the sample. As discussed in Chapter 4, the recruitment process for this study may have been biased in recruiting patients who
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attended and understood what was meant by CR. As the aims of this study were presented in the patient information as being about how participants make the decision to attend CR, people who did not attend CR may not have thought their participation would have been relevant to this study. The interviews were carried out six months after receiving the first questionnaire, and the interviews were based on the recall of events and feelings after six months. During this time memories (for example receiving a telephone call) may have been modified by whether they attended CR or not.

The sample used in this qualitative study may not have been representative of a wider cardiac population. As this was a sample predominantly of white middle age men, ethnic minorities were under-represented in this study. Therefore, in generalising these results to a wider cardiac population, caution should be exercised.

CR services referred two participants to a psychologist with HADS in the normal range at both baseline and follow-up. Although the HADS is a commonly used scale in cardiac patients and has been reported to be reliable in this population (Davidson et al., 2006), this does raise the question of when is the most optimal time to capture all cases of elevated depression and anxiety symptoms. The timing of delivery of screening tools to measure depression and anxiety should be a consideration for future studies.

In this study, participants with scores indicating clinical anxiety at baseline had different approaches to their recovery. From the interview data, participants who needed reassurance and feared they could not make the necessary lifestyle changes on their own
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attended CR and saw a reduction in their anxiety score, whereas those with avoidant
behaviour dropped out of CR and saw no improvement in either their mental or physical
health. This role of anxiety is potentially an important issue that needs further
exploration. This dual role of anxiety could explain the quantitative studies that have
reported anxiety as having no effect on attendance and completion (e.g., Farley, 2003;
Lane et al., 2001). Participants with one set of anxiety symptoms (needing support and
reassurance) may cancel out participants with avoidant symptoms. It is interesting to
observe that of the three participants with baseline HADS scores in the range for clinical
anxiety both male participants initially perceived CR with negativity and had
misconceptions about what attending CR would involve, whereas the female participant
believed CR to be necessary to her recovery. It would be interesting to explore whether a
gender difference exists in patients with anxiety and their perceived necessity of CR.
Although the number of women participants in this study was too small to observe any
systematic gender differences in the approach to recovery after a cardiac event, this
would be an interesting line of inquiry to follow in future studies.

In the recruitment for the qualitative study very few participants with elevated
depression symptoms gave permission to be followed up by researchers or to be available
for an interview. Therefore, with this limitation, it was not possible to fully understand
the role of depression on CR attendance and completion in this sample, but it was
possible to consider the role of anxiety. Further studies are needed to understand how
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patients with scores in the range for clinical depression experience recovery from a cardiac event.

For the participants who dropped out of CR with anxiety, both reported experiencing many physical symptoms and had poorer functional status, which is consistent with the evidence (French et al., 2006). Both participants were concerned about how their health was affecting their employment. It is not clear whether this concern with employment is a part of recovery from a heart event that increases anxiety or is a mechanism being used to avoid dealing with their recovery from their cardiac event and is worthy of future investigations.

Clinical implications

Participants taking part in this study cited barriers to CR attendance also reported in other studies. The barrier of transportation had been abated by the provision of hospital transport to assist patients in getting to and from CR. The evidence from the semi-structured interviews revealed the importance of receiving a telephone call from CR inviting participants to attend, and that this was relatively impervious to the impact of psychological distress. Receiving a telephone call appears to be a very simple solution to increase uptake of an essential service with proven benefits to this group of patients. However, this could create a few operational issues for health care services, as it appeared from the sample that more participants wanted to attend CR than there were
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places available. Attributing lack of attendance to depression or anxiety may, therefore, be inappropriate if simple strategies such as this are potentially so effective.

Improved knowledge of the characteristics of people who are less likely to attend and reasons for non-attendance is needed to enable strategies to be developed to encourage greater attendance. A challenge for health care services is how to get people to attend services that they do not think are relevant for their recovery. Clear information needs to be available for people to inform patients of the needs and relevance of treatment. Provision of alternative services may benefit patients like Matthew and Jim. As both men have concerns with their employment, a more interactive online resource could be more acceptable to some patients.

Two participants with scores for both anxiety and depression in the normal range were referred to a psychologist by CR staff. One participant was struggling with managing stress and the other was having problems dealing with aggression. Referring patients onto psychological services to treat psychological issues is an effective way to treat people who might need more support than offered within a CR program. By being referred to a psychologist, patients receive the benefit of specialised treatment for any mental health issues they are experiencing and the benefits of CR that are effective at reducing the risk of recurrent events.

A common theme from the participants of this study was not recognising that some of the emotions they were experiencing were the result of depression and anxiety
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symptoms. This has important clinical implications, if patients do not recognise what they are feeling is not a normal reaction to their heart disease, they are less likely to seek help. There is a need for the provision of more information regarding negative emotions that may be experienced after and before a cardiac event and how and where patients can get help.

Conclusions

Receiving a phone call was found to be an effective facilitator for CR attendance in this sample. This simple method appeared to encourage people to attend and was an opportunity to dispel some misconceptions about what a CR program involves. Participants who did not complete CR had scores on the HADS indicating clinical anxiety, which is supported by existing evidence. However, anxiety was also found to be a facilitator for CR completion. For non-attendance, avoidance seemed to be an anxiety symptom that affected attendance, whereas for completion the need for reassurance and support was found to be beneficial for recovery.

Patients, who reported fewer symptoms and were more positive, had fewer negative illness perceptions. Participants who were struggling with their recovery, had symptoms in the range of clinical anxiety at follow-up, had more symptoms and believed they had little control over their illness.
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Chapter 6: General Discussion

The overall aim of this thesis was to explore the role of depression and anxiety in both the onset and the recovery from CHD. In the first instance, this was done by measuring whether having depression and anxiety is associated with a risk of developing CHD. A second aim was to assess the effectiveness of CR in reducing symptoms of depression and anxiety. The third aim was to explore the effects of depression and anxiety on how cardiac patients make decisions regarding their recovery and treatment.

This final chapter provides a summary of the key findings from this thesis and their implications. The main conclusions are briefly summarised before moving on to discuss their importance and relevance. This is done from both the perspective of what these results add to the understanding of the relationship between depression and anxiety in CHD development and recovery, and their implications for future research and clinical practice.

Summary of findings

A mixed methods design was used to address the three research aims of this thesis. This design was used to develop a more nuanced understanding of how depression and anxiety impact on cardiac disease, including its onset and patients’ subsequent recovery. The following paragraphs triangulate the results addressing each aim of the thesis independently.
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Are depression and anxiety associated with an increased risk of incident CHD? Over the past three decades epidemiological studies have been conducted to determine whether depression and anxiety are independent risk factors for CHD in healthy populations (e.g., Ford, Mead, & Chang, 1998; Janszky, Ahnve, Lundberg, & Hemmingsson, 2010; Kubzansky, Koenen, Jones, & Eaton, 2009). The study in Chapter 2 is the first large-scale study to measure the association between comorbid depression and anxiety in CVD subtypes and to report the findings separately for men and women. Previously only one other study has reported on the risk of comorbid depression and anxiety on incident CHD in a sample of women (Berecki-Gisolf et al., 2013). The results in this thesis corroborate Berecki-Gisolf and colleagues’ (2013) findings identifying comorbid anxiety and depression as increasing the risk of CHD. This thesis extends these findings by reporting on a male population and by breaking down CVD into subtypes. A relationship was only found between comorbid depression and anxiety and the onset of CVD, ACS, and AMI in women. No relationship was found for men. The results of this study support the importance of future studies separating out different elements of the condition, by examining CVD subtypes, and examining relationships separately in men and women, lest important relationships are overlooked. Examining these variables separately are necessary to both understand and address differences in risk. Women’s heart disease tends to start later in life than men (Rollini et al., 2009), and anxiety and depression are also reported to be more prevalent in women than men (Seedat
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et al., 2009). Although depression and anxiety are comorbid both in the general population and in populations with chronic disease (Dickens et al., 2006), only one study to date has examined whether comorbid anxiety and depression is associated with an increased risk of incident CVD (Berecki-Gisolf et al., 2013). The most effective method to explore these relationships is by using routinely collected hospital data to ascertain outcomes. While using this type of data brings with it challenges and limitations around capturing subclinical events and lack of information on potential confounders, it is the only practical study design for addressing this research question.

In the current study only depression was associated with an increased risk of CVD in both men and women. However, when CVD was broken down to explore the relationship with different subtypes of CHD, e.g., incident ACS, AMI and unstable angina, there was no relationship with depression found in either men or women. In contrast, anxiety was not found to be associated with any CVD or CHD in either men or women. These findings are not consistent with the evidence for depression and CHD. Many cohort studies and meta-analyses have found depression to be associated with incident CHD (Nicholson et al., 2006; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). This discrepancy between the findings of this current study and previous evidence could be explained by the different populations, methods used for measuring CVD and depression, or other features of the study design. The evidence for anxiety as a risk for CVD in the literature has been less consistent, with fewer cohort studies finding an
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association (Bunker et al., 2003; Kubzansky et al., 2006). A meta-analysis found that anxiety was associated with a significant increased risk of CHD (fatal and non-fatal), although this trend was not significant for non-fatal CHD alone (Roest et al., 2010). In a large population-based cohort study of men anxiety and not depression was associated with an increased risk of CHD (Janszky et al., 2010). As many different measures of anxiety and depression have been used in previous studies, and the effects have not been examined separately by gender, it is likely that methodological differences between studies could explain the inconsistencies in findings.

The impact of depression and anxiety on CR attendance and completion.

One of the aims of this thesis was to address the inconsistencies in the literature to understand how depression and anxiety may impact both attendance and completion of CR. This aim was addressed in Chapters 4 and 5 using a mixed methods design. The questionnaire data described in Chapter 4 were able to quantify the prevalence of elevated levels of depression and anxiety in the study’s sample. This chapter also explored the impact of psychological distress on CR attendance and completion, and whether there existed a significant interaction between other psychosocial variables that may influence decisions regarding treatment and recovery. Semi-structured interviews were undertaken with a small number of participants to gain a more in-depth understanding of how cardiac patients make the decisions to attend CR and their approach to recovery. Due to the smaller, than expected sample size in the quantitative study, triangulation provided a
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mechanism to gain a greater understanding of what patients with elevated levels of depression and anxiety experience in the wake of a cardiac event.

In the quantitative study, it was not possible to conclude whether having an elevated score on the HADS for depression and/or anxiety at baseline had any impact on CR attendance or completion. Although the results for this chapter found neither depression or anxiety to predict attendance or completion at CR, these results need to be treated with caution due to the smaller than expected sample size and thus limited power. The qualitative results reported in Chapter 5 also indicated depression and anxiety to have little impact on the decision to attend CR, but this finding does not help address the inconsistencies in the current literature about the role of depression and anxiety symptoms on CR attendance. Quantitative studies have resulted in conflicting findings, with some suggesting depression has a role in predicting CR attendance (e.g. Whitmarsh et al., 2003), whereas other studies have found depression to predict non-attendance (e.g. Kronish et al., 2006). The inconsistencies in the existing data regarding the role of depression in CR attendance may be reflective of the limitations of using questionnaire data to address CR attendance. Questionnaires are not always designed to measure the different approaches adopted by hospitals to recruit patients to their CR programs. Using a qualitative approach allowed for a more in-depth inquiry into the barriers and facilitators of CR attendance. The most common trigger of CR attendance reported from the interview data was receiving a telephone call inviting patients to participate. All
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participants who received a telephone call inviting them to CR attended, with only one exception. All participants who did not receive a telephone call inviting them to attend did not participate in CR. The findings from Chapter 5 suggest that physical facilitators and barriers play an important role in CR attendance. However, psychological variables may have a more important role in CR completion.

A key finding from the qualitative study suggests anxiety may have a dual role in the recovery from a cardiac event. Anxiety was found to act as both an enabler as well as a barrier to CR attendance and completion, depending on the type of symptoms being experienced by the participant. Of the three participants who did not complete CR in the qualitative study in Chapter 5, two had scores on the HADS indicating clinical anxiety. These two participants discussed many avoidant behaviours in their interviews, with both reporting not taking an active role in their recovery to maintain the necessary lifestyle changes. Although previous studies have explored the impact of elevated anxiety symptoms on CR completion, the evidence is from cohort studies using a number of standardised scales (e.g. McGrady et al., 2009). The role of anxiety as a facilitator was demonstrated by two participants who completed CR. Both participants at baseline had scores on the HADS indicating clinical anxiety. In their interviews they both reported being motivated to attend and complete CR as they needed reassurance and support. The findings from this thesis highlight the complex role of anxiety in the completion of CR as it not only acts as a barrier but also as a facilitator for some participants. This complex
role of anxiety would have been difficult to unpack using only quantitative analysis. Using qualitative methodology, it was possible to achieve a greater understanding of the important role anxiety has on patient’s recovery from CHD.

The opportunity to explore relationships between psychological distress and the interaction between illness perceptions and CR beliefs on a patient’s decision on recovery was limited in Chapter 4 due to the small sample size. Bivariate relationships were found between these psychological variables, however, there was no relationship between them and CR either attendance or completion. It is possible that the sample size was too small to detect a relationship due to the strong effect of other variables not measured, for example, practical issues such as whether the participant received a telephone call from CR services which the qualitative study suggested had a particularly potent effect.

The interrelationships between illness perceptions and cardiac beliefs were potentially more instructive than their relationship with CR attendance and completion. Participants who had greater concerns about participating in the exercise component of CR had more negative illness perceptions and more elevated levels of depression. This finding suggests that participating in exercise may not just be perceived as a potential risk, but the broader potential benefits for recovery may not be fully understood. In Chapter 5, patients who dropped out of CR with elevated levels of anxiety had lower perceived personal control than those participants who did not drop out. This response is consistent with a key component of the CS-SRM, perceived control. The strongest
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predictor for attendance at CR, explaining 5% of the overall variance, was the patient’s belief they could control their illness (French et al., 2006). This result supports the use of CS-SRM in understanding how cardiac patients adjust to their disease and the importance of the relationship between depression, anxiety and illness perceptions.

The qualitative study offers a few additional insights into how components of CR, such as supervised exercise sessions and the group format of CR, enable patients to share experiences. This experience may provide reassurance and support to participants with elevated levels of anxiety who attend CR. Seeking reassurance to reduce symptoms of anxiety is contrary to the role of reassurance seen in many anxiety disorders, where seeking reassurance can increase symptoms of clinical anxiety disorders.

**Is CR effective at reducing depression and anxiety?** Three different methodological approaches were employed to explore this question, a systematic review, reported in Chapter 3, and both a quantitative and qualitative study reported in Chapters 4 and 5 respectively. Most of the studies included in the systematic review were of a poor methodological quality, and the quantitative study was hampered by a small sample and limited power. Hence the conclusions drawn from the systematic review and quantitative study are tentative at best, and while they indicate it is unlikely that CR is effective at reducing depression and anxiety, they should be viewed with extreme caution.

The study in Chapter 4 aimed to address some of the limitations and recommendations raised in the systematic review in Chapter 3. The aims were addressed
by evaluating how effective CR was at reducing depression and anxiety among participants with elevated levels at baseline. CR had no detectable effect on reducing depression and anxiety in this sample, however, as previously mentioned, this result may be due to the small sample size, limited power and the small number of people with raised levels of anxiety and depression.

While overall no significant impact could be found for participating in CR on depression and anxiety, the systematic review by examining the effectiveness of ACR in comparison to SCR did identify interventions that could be enhanced. The potential significance of women only CR was recognised in one high-quality study, where the addition of motivational interviewing to an intervention resulted in an improvement in depression symptoms (Beckie et al., 2011). A low-quality non-RCT found both depression and anxiety symptoms reduced in an ACR which involved home-based CR and a copy of the Heart Manual compared to SCR where no improvements were reported. This finding suggests that there may be some components of ACR or certain subgroups, such as women, who may benefit from modifications to standard programs and this would be worthy of further investigations.

There is no evidence to suggest from the interview data that CR effectively reduced anxiety, but it was observed CR might assist in targeting symptoms of anxiety for some patients who needed reassurance about what they were experiencing and support to make the necessary lifestyle changes.
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Strengths

One of the strengths of this thesis is the mixed methods approach used to address the aims. By using different methods, it was possible to gain a wider perspective on the complex role depression and anxiety have in both the onset of CHD in healthy populations and the impact it has on recovery after a cardiac event.

The first research aim of the thesis was to examine depression and anxiety as a risk for incident CHD. Using a large population with a longitudinal approach meant it was possible to address the research aims using the same measures for CVD, depression and anxiety, and explore the risks separately for men and women without comprising statistical power. This strength meant it was possible to address some of the inconsistent findings from recent meta-analyses and previous cohort studies which had used smaller samples (Nicholson et al., 2006; Rugulies, 2002; Van Der Kooy et al., 2007; Wulsin & Singal, 2003). Despite the meta-analyses having large samples, the findings were limited by the different measures used for both exposure and outcome variables (Nicholson et al., 2006). Adopting this approach and reporting the findings separately by gender, the risk of CVD was found to be different for women with comorbid anxiety and depression.

As previously mentioned earlier in this chapter both a quantitative and qualitative study was used in this thesis to explore how the role of depression and anxiety affects cardiac patients’ decisions about recovery, and whether CR was effective at treating depression and anxiety. From the data collected in the quantitative study, it was possible
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to identify the participants with HADS scores indicating elevated levels of depression and/or anxiety who were willing to participate in an interview. This process allowed for a purposive sample of participants to be recruited to address the research aims using qualitative methods. A strength of using a qualitative approach in this way was it enabled the role of anxiety to be unpacked. From this data, it was possible to gain a greater understanding that anxiety can have a dual role in cardiac patients acting as either a barrier or a facilitator to recovery. A further strength of this approach was identifying the importance of a telephone call from CR services on attendance at CR. It would not have been possible identify the importance of a telephone call from CR services as a facilitator for CR attendance with only a quantitative approach.

Limitations

Many of the limitations of each study are addressed in detail in the relevant chapters. The limitations to be discussed in the following paragraphs are only related to the conclusions of the overall thesis. This section is organised by addressing the most significant limitations first.

One of the greatest limitations for this thesis was the small sample size for the quantitative study in Chapter 4. Due to the smaller than expected number of participants recruited from the two participating hospitals, there was a lack of statistical power which limited the ability to discern any meaningful results. This low rate of return of baseline questionnaires meant that it was not possible to address the research questions arising
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from Chapter 3, which was fundamentally the aim of the study. The small sample size severely restricted exploring CHD in men and women separately and being able to examine the effectiveness of attending CR in participants with elevated symptoms of depression and anxiety separately, thus limiting the conclusions that could be drawn from the results of the analyses.

Recruitment issues were also problematic for the qualitative sample. In the recruitment for the qualitative study very few participants with elevated depression symptoms gave permission to be interviewed and therefore it was not possible to include them in this part of the study. This was disappointing, particularly because even though recruitment was low for the quantitative sample, the prevalence of participants with scores on the HADS indicating either borderline or clinical depression was 30%. In comparison with other studies, the number of participants with borderline and clinical depression at baseline was slightly higher in this study (Moser & Dracup, 1996). Not being able to access these participants limited the study's capacity to understand the role of depression on CR attendance and completion.

In Chapter 2, a limitation was the relatively short follow-up period, which may explain why the results for depression and anxiety do not support the current literature. Previous large-scale studies have investigated the role of depression and anxiety on incident CHD (Berecki-Gisolf et al., 2013; Janszky et al., 2010) with longer follow-ups, allowing for the occurrence of more events of CHD to be counted. The age of participants
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at follow-up and their risk of heart disease should be an important consideration. It is noteworthy that Janszky et al., (2010), only found anxiety and not depression diagnosed in early life to be a risk for the onset of CHD at 37 years follow-up. The authors reported a limitation of their study was at follow-up the men in their sample were in their late fifties which is still relatively young for the risk of CHD. The authors suggested a longer follow-up with more CHD events may have found an increased risk for depression. Longer follow-up times although beneficial, need to extend to the age where participants are at an increased risk of CHD. In comparison, the study in this thesis examined a population over the age of 45, an age where the onset of CHD increases. However, due to the short follow-up, this may not have allowed enough time for incident CVD events to occur, perhaps leading to an underestimation of the magnitude of the relationship between depression and anxiety as a risk for CVD.

Further limitations of this study that could explain the null findings were discussed in Chapter 2. These limitations include the way in which pre-existing depression and anxiety were operationalised, with participants being asked if they had ever been diagnosed by a doctor with depression and anxiety, an approach which leaves a great deal of potential for error in identifying participants with an actual history of either condition. Utilising the data from an existing cohort study, while advantageous to accessing a large population, thus did limit the variables available to address the research aims of this study. While the measures for depression and anxiety might have been
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appropriate for the original research questions, for subsequent questions, as addressed by this thesis, the aims may have been limited by the particular measures originally selected. An example of the limitation of using doctor diagnosis for depression and anxiety is highlighted by evidence that suggests men are less likely to either seek help from a doctor or admit to being treated for a mental health condition (American Psychiatric Association, 2012). It is possible due to the self-report measures used for depression and anxiety that men with either disorder could have been underrepresented in this sample, as they may be less likely to either seek help from a doctor or admit to being treated for a mental health condition (Seedat et al., 2009). As this study relied on self-report, it is possible that cases of depression and anxiety could have been missed.

Many different methods have been used to measure depression in studies examining its risk for incident CVD. These different measures used may offer a possible explanation for the inconsistencies between results of this and previous studies. Results from studies using self-report depression scales, report the association between depression and ACS to be weaker than when a diagnosis for clinical depression is used. As a stronger effect between risk and onset of ACS is found when using a clinical diagnosis of depression, this suggests there is a dose-response relationship between the severity of depression and ACS (Nicholson et al., 2006). Studies that measure depression at baseline with a diagnostic interview report a lower prevalence of depression at baseline than studies using self-report scales. However, self-report studies may have a
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misclassification of non-depressed as depressed in their samples. Therefore, studies using a diagnostic interview to measure clinical depression may report a truer picture of the association between depression and the onset of CHD and as a result could be a more effective measure to use.

Future research implications

In undertaking this research, a number of issues have become clear as future research priorities. This thesis aimed to address gaps and inconsistencies in the current evidence examining the associated risk between depression and anxiety and both the onset and the recovery of CHD. Although this thesis has contributed to the current evidence, gaps remain. These issues and gaps need to be addressed by future research and are discussed in the following sections.

The importance of depression and anxiety for CHD risk. A key finding from Chapter 2 was the importance of exploring the results separately for men and women. The risk associated with depression and anxiety and the onset of CVDs differed between men and women. This raises the questions, what does current evidence tell us about the differences between men and women’s CHD and why women with anxiety and depression may have an increased risk of CHD? Is this because depression and anxiety are more prevalent in women (Seedat et al., 2009) or do the symptoms of depression and anxiety pose more of a risk for women experiencing a cardiac event? To help understand
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the mechanisms between depression and anxiety and CHD future research should explore
men and women separately.

Only one other study has examined the role of comorbid depression and anxiety in predicting the onset of CHD and found it to be a significant risk (Berecki-Gisolf et al., 2013). The authors commented that the somatic symptoms experienced by those with depression and anxiety could also be indicators of underlying heart disease, e.g. fatigue, loss of energy, palpitations, shortness of breath, etcetera. Caution is needed in describing depression or comorbid depression and anxiety as increasing the risk for the onset of CVD or CHD, as this does not necessarily represent a causal relationship. Describing depression or anxiety as a contributing cause of CVD and CHD ignores the possibility that the presence of depression and/or anxiety before a cardiac event may be reflective of preclinical cardiac changes (Frasure-Smith & Lеспérance, 2010).

In recent years the research focus has been starting to shift towards breaking down the elements of depression to investigate whether there are symptoms of depression that are more responsible for worse cardiac outcomes in participants with CHD (Frasure-Smith & Lеспérance, 2010). In previous reviews, the type of diagnosis for depression may be conferred based upon widely varying constellations of symptoms, and it is, therefore, possible that a certain combination of symptoms may pose a greater risk than others. Neither this study nor the Berecki-Gisoff et al., (2013) study measured symptoms of depression or anxiety. This meant it was not possible to explore if there are any shared
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symptoms between the two disorders, and if there are, what these common symptoms may be that increase the risk of CHD. At present the mechanism between depression, anxiety, and CHD are not understood, a relevant future research direction to explore would be to establish whether there is a combination of shared symptoms between anxiety and depression and an increased risk of cardiac events. As depression and anxiety are commonly experienced disorders, future research using longitudinal designs are feasible to understand this relationship.

As mentioned in the limitations section of this chapter and Chapter 2, the study had a mean follow-up period of 2.4 years. As discussed earlier in Chapter 2, the mean follow-up of the studies included in review articles was 10.8 years (Nicholson et al., 2006). This current study addressed many of the inconsistencies that existed in the literature when examining depression and anxiety as a risk for CHD. Being able to follow up this cohort at a later date, when a longer follow-up period of the APDC data is available, it is highly probable there would be more hospitalisations for ACS, AMI, and unstable angina increasing the number of measurable observations. A longer follow-up period would allow for the longer term effects of depression and anxiety on CVD to be examined and address the inconsistencies further in the current literature.

An interesting research direction for a greater understanding of the association between depression and anxiety as a risk for incident cardiac events could be exploring the age of onset of depression. Very few studies have explored this question to date. Of
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the studies that have, only one included a large cohort of young men, between the ages of 18 and 20 years, who were assessed by clinical diagnostic interviews for both depression and anxiety disorders. They were followed for 37 years. Meeting the criteria for an anxiety disorder at a young age was significantly associated with either a cardiac event or death (Janszky et al., 2010). Although this study did not examine women, it provides evidence that the role of anxiety is a risk for the onset of CHD.

Only one other study appears to have examined the implications of age of onset of depression. It found in people under 40 years of age, depression and attempted suicide were independent risks for CVD and IHD mortality (Shah, Veledar, Hong, Bremner, & Vaccarino, 2011). Other studies that have looked at the age of onset of depression have focused on carotid intima-media thickness (CIMT), which is used to detect the presence of atherosclerosis (Seldenrijk et al., 2011; Smith et al., 2009). Seldernrijk et al. (2011) looked at 470 participants between the age of 20-66 years. Late onset of depression (>40 years) was associated with an increased risk of CIMT with no depression. Further research on the age of onset could extend understanding into what the mechanisms may be for depression and anxiety increasing the risk for CHD. By examining this evidence separately for men and women could explain why women with comorbid depression and anxiety are more at risk of CVD.

It is not clear from the current evidence, or the findings presented in this thesis, what the exact mechanisms are that result in depression and anxiety increasing the risk of
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CHD. This thesis did not set out to address the mechanisms, nor did it find an association between depression and CHD. It did, however, highlight some gaps that exist in current evidence that is not just isolated to examining incident CHD. Men and women experience CHD differently and therefore where possible, research in this area should examine them separately. Depression and anxiety are often comorbid, therefore to further our understanding of their role on CHD it is important to include measures for both in future research.

**CR as an intervention for reducing depression and anxiety.** Consistent evidence supports the effectiveness of CR in reducing morbidity and mortality (Rutledge et al., 2013). However, the studies presented in Chapter 3 and 4 were unable to conclude whether CR alone is a sufficient intervention to address psychological distress. It is very likely that for patients with elevated levels of depression and anxiety a separate mental health intervention to complement their attendance at CR would be beneficial. The current evidence from intervention studies and review articles are inconclusive in determining which psychological interventions are effective at reducing either depression or anxiety or whether treating these conditions is effective at reducing morbidity and mortality (Rutledge et al., 2013).

The results from RCTs exploring how best to treat depression and anxiety in a cardiac population have mostly examined either pharmacotherapy, CBT or a combination of both. In considering alternative interventions to treat and reduce the symptoms of
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depression and anxiety that could be used to complement CR, the evidence is mixed on what treatments are effective. The majority of evidence on the effectiveness of interventions has focused on depression, with very few studies and reviews reporting on anxiety either in addition or alone. The findings from systematic reviews on the effectiveness of psychological interventions to reduce depression are mixed. One review reported no overall effectiveness of psychological interventions for reducing depression (Linden et al., 2007), whereas others have found support for only CBT when compared to UC (Baumeister, Hutter, & Bengel, 2011). A recent review attempted to identify the characteristics of psychological interventions that improve depression in patients with CHD (Dickens et al., 2013). The findings from this review proposed a need for more high-quality trials. They recommended future RCTs should focus only on CBT and problem-solving interventions for inclusion in future treatment programs.

It is possible that certain components of CR may contribute to reducing depression and anxiety. Identifying these successful components is worthy of future investigation. A large part of a CR program is aimed at changing unhealthy behaviours and improving exercise capacity. The qualitative interviews in Chapter 5 demonstrated CR enabled participants to exercise. Exercising helped them feel fitter despite being fearful before attending CR that the symptoms they experienced after physically exerting themselves were indicative of the onset of another heart attack. Attending CR helped alleviate this fear and gave them the confidence to build up their physical strength. The
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mechanisms that may make CR contribute to any reduction of elevated symptoms of depression and anxiety in these groups may partly be through exercise and could be worthy of further research.

Exercise has been found to be an effective approach to treating depression in non-cardiac populations. RCTs of people with MDD in the general population have shown that exercise is as effective at reducing depression as antidepressants (Babyak et al., 2000; Blumenthal et al., 1999). CR programs aim to increase exercise capacity, and increase peak oxygen intake. Previous research found that with every 1% increase in peak oxygen uptake result there was a 2% decrease in mortality (Vanhees, Fagard, Thijs, & Amery, 1995). However, participants with MDD showed less improvement over time in peak oxygen uptake than patients without MDD (Swardfager et al., 2011). More research needs to be done to understand who best benefits from CR and any associated increase in exercise. A possible focus for future research could be to extend the line of inquiry by Swardfager et al. (2011) and explore possible links between exercise and not only MDD, but extend this to include patients meeting diagnostic criteria for other specific psychological conditions (e.g. GAD) or those with elevated symptoms of depression and anxiety who would not merit a formal diagnosis. Exercise is an important part of recovery from a cardiac event; it is important to understand how this benefit may differ in patients with depression and anxiety.
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CR programs are also meant to address the psychological needs of patients. The components of some CR programs that address these needs may be effective at preventing the onset of depression and anxiety symptoms. It is possible that CR is effective at reducing certain symptoms of depression and anxiety, through stress management components, the social support of CR groups, and addressing behaviours such as exercise, diet, and information about heart disease, many of which have beneficial effects on psychological distress, even if no overall effect is detected.

Reviews of studies targeting depression in a cardiac population found a range of pharmacological treatments, especially selective serotonin reuptake inhibitors (SSRI’s), to have a small, yet clinically significant effect on reducing depression and a small effect on reducing mortality (Baumeister et al., 2011; Pizzi et al., 2011). Whereas a review of both group and individual therapy found that psychological therapies showed a small, yet clinically significant, improvement in both depression and anxiety, with a small effect on mortality (Whalley, Thompson, & Taylor, 2012). However, this review found that not all studies targeted patients diagnosed with any specific psychological condition, with many not meeting any diagnostic criteria or having elevated symptoms. This limitation may have contributed to a floor effect. It is possible if all studies had separately analysed the population meeting criteria for depression and anxiety rather than examining only the mean score for the whole study population, the effects would have been larger.
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Despite these findings, CR is still an important intervention with evidence to support its benefits for reducing mortality and morbidity (Rutledge et al., 2013). It is possible, although there is no conclusive evidence, CR may be effective at preventing the onset of depression and anxiety. Future research examining the effectiveness of CR at reducing depression and anxiety should address this research question by investigating patients with elevated depression and anxiety symptoms. This should be investigated using RCTs or high-quality non-RCTs if more appropriate. At present, there is no evidence that addresses this research question sufficiently.

The American Heart Association (AHA) has recently recommended a need for further research on identifying the independent effect of anxiety disorders, measured by diagnostic interview, on CHD prognosis (Lichtman et al., 2014). Tully et al., (2014) voiced the lack of current evidence from systematic reviews exploring CHD and anxiety disorders reveals a critical limitation for clinical diagnosis, prognosis, and interventions.

Future research should explore whether there are components of CR that may help reduce anxiety symptoms in patients. From the qualitative study, two participants with baseline scores for anxiety in the clinical range and who completed CR had a reduction in their anxiety scores to borderline at follow-up. Both of these participants in their interviews discuss how they found attending CR reassured them about the physical symptoms they were experiencing and gave them the support and motivation to make the necessary changes to their lifestyle. Determining if some anxiety symptoms are
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associated with more risk and other symptoms are more treatable in CR is worthy of future research. More research exploring the role of anxiety is needed. In the first instance, this should be done through qualitative methods with a larger sample of patients with anxiety, and this should be extended to patients with depression. Quantitative studies should then follow up the findings to explore if this dual role is replicated in larger samples, to help identify those patients who may need additional services and interventions.

A possible future research direction that could prove promising is the use of the internet and smartphones. A recent example of this approach to improve treatment adherence is provided by Petrie, Perry, Broadbent, & Weinman, (2012), who developed a text-messaging intervention to increase adherence to preventer medication treatment in young adults with asthma. After an initial assessment of the patient’s illness and treatment beliefs, each patient was sent targeted text messages aimed at modifying unhelpful beliefs over the following few weeks. This resulted in significant changes in beliefs and in treatment adherence, which persisted for six months after the text messages had stopped. Clinical trials have recently started using this technology for the treatment of cardiac patients. The Consumer Navigation of Electronic Cardiovascular Tools (CONNECT) is an e-health trial to assist cardiac patients lower their risks of CVD events through interactive tools. The tools provided include sending reminder messages to participant’s smartphones about medicines and a healthy lifestyle. It also provides
participants with a health tracker risk calculator (Redfern et al., 2014). The results of this trial and other trials utilising smartphones and the internet is an interesting future research direction that could prove an effective way to manage cardiac patients’ recovery and reduce the risk from further subsequent cardiac events.

Future research should focus on exploring the effectiveness of interventions to treat depression and anxiety that could run in tandem with CR programs. Both anxiety and depression symptoms are common in cardiac populations (Doering, Moser, & Davidson, 2010). It is not just important to identify and treat all new cases; it is also necessary to improve outcomes for these cardiac patients. It is imperative to manage persistent cases and to reassess treatment plans for those who may relapse.

The role of depression and anxiety on the approach to recovery. A limitation already discussed earlier in this chapter was the small sample size of the quantitative study in Chapter 4. As with many other studies in this area, the sample obtained was mainly middle-aged men. A limitation of previous research is the predominance of middle-aged males included in the study populations. It would be advantageous to gain an understanding of the issues experienced by the underrepresented groups within the literature, especially women. Despite the low attendance rates for women, when they attend CR, the effectiveness of these programs appears to be no different according to gender (Ades, Walderman, McCann & Weaver, 1992; O’Farrell, Murray, Huston, LeGrand, & Adamo, 2000). However, once women do enrol they are less likely to
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adhere to CR than men (Daly et al., 2002; Grace et al., 2002; Marzolini et al., 2008). Grace et al. (2010) concluded that the literature on CR adherence for women is littered with inconsistencies in the way adherence is measured, resulting in a lack of comparability between studies and a significant amount of variation in comparison groups. Information specific to women may help focus on risk reduction to address their needs in what some authors consider a predominantly male dominated environment (Sanderson & Bittner, 2005). There has been a call from prominent health bodies for more gender-based research to be undertaken to inform health service planning and delivery (Australian Medical Association, 2014). This will enable the gaps to be addressed in our understanding of how men and women experience chronic conditions differently (Australian Medical Association, 2014). A consideration for further research in this area should be to recruit samples that are more representative and have equal gender representation.

There appears to be no other qualitative studies to explore how anxiety or depression may affect patient’s decisions around recovery and CR attendance. Studies investigating the role of anxiety in people with CHD are not as numerous as those examining the role of depression (Sullivan, La Croix, & Baum, 1997; Sullivan, La Croix, Spertus, & Hecht, 2000). Data from quantitative studies suggest that cardiac patients with high levels of depression and distress are significantly more likely not to complete a CR program (Swardfager et al., 2011; Turner, Evans, Bethell, & Goddard, 2003). This is a
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concern, as it has been reported that depressed patients who failed to complete CR have a 4-fold increase in mortality (Milani & Lavie, 2007). It is not clearly understood why patients with depression are less likely to complete CR. From the qualitative data, it was only possible to observe participants with elevated anxiety symptoms. From the interviews, the role of anxiety appeared to act as a facilitator for completion of CR in patients who needed reassurance and as a barrier in other patients who were avoidant. Better ways of being able to identify those who are unlikely to attend or complete CR are needed. Further qualitative studies should be carried out to observe whether anxiety has a dual role in the completion of CR and extending this to patients with depression. Future research using qualitative methods will help to understand the mechanisms involved as to why people with elevated levels of depression and anxiety are less likely to complete CR.

The results from the qualitative study demonstrate the importance of patient’s illness perceptions in the approach to recovery from heart disease. The participants with elevated levels of anxiety who dropped out of CR appeared to discuss having less control over their illness, perceiving their heart disease as having more serious consequences. These participants perceived CR as being necessary to their recovery. This indicates that CR beliefs may be a good predictor of attendance and completion of CR and the importance of addressing illness perceptions in cardiac patients. Evidence supports depression and anxiety as being related to illness perceptions (Grace et al., 2005; Stafford et al., 2008). This study supports a link between CR beliefs and elevated levels of
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depression and anxiety. Illness perceptions have been found to be modifiable (Janssen et al., 2013). If CR beliefs are modifiable, brief interventions during initial hospitalisation could increase CR attendance and completion. It is important for healthcare providers to be able to identify patients most at risk, especially those with depression or anxiety. These patients would benefit from CR, but may also require a different intervention to address high levels of depression and anxiety that cannot be treated with CR only.

Clinical implications

The evidence presented in this thesis for the risks associated with depression and the onset of CHD suggest that the National Heart Foundation of Australia may be slightly ahead of the evidence by citing depression as a risk factor for heart disease. The evidence from this thesis is unable to support depression as a risk for the onset of CHD for either men and women. However, identifying and treating depression and anxiety remains an important priority, as both impact quality of life and functionality, regardless of the possible risk they may pose to CHD onset.

Although the mechanisms for the potential relationships between depression, anxiety, and CHD are not entirely understood, the impact depression and anxiety have on a person quality of life cannot be underestimated. Having either depression or anxiety can lead to poor lifestyle choices, as can poor lifestyle result in depression and anxiety. Health education campaigns aimed at preventing chronic diseases need to not only focus on a healthy eating and the importance of physical activity, they also need to focus on
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promoting good mental health, to enable people to recognise the symptoms of anxiety and depression. The role of anxiety and depression should not be underestimated in the prevention of chronic disease.

It has been suggested that physicians may overlook anxiety symptoms in cardiac patients, regarding them as needlessly worrying over the somatic symptoms they may be experiencing (Thurston, Rewak, & Kubzansky, 2013). Thurston et al., (2013) suggests that overlooking anxiety symptoms could be a missed opportunity by physicians to identify and address anxiety symptoms which could improve the mental well-being of patients and possibly reduce or delay the onset of CVD.

The American Heart Association (AHA) recommends the screening of all cardiac patients for depression. This move is due to the high prevalence of depression in a cardiac population and the associated risk of morbidity and mortality (Colquhoun et al., 2013; Davidson et al., 2006; Lichtman et al., 2008; Orth-Gomér et al., 2009). In addition to this, the AHA, endorsed by the American Psychiatric Association has recommended that all patients identified with depression should be screened for an anxiety disorder (Lichtman et al., 2008). As there is high comorbidity between the two disorders and an overlap in the symptoms attributed to each disorder, it could be beneficial to screen for both after a cardiac event. This could identify those with a higher risk of morbidity or mortality and assist in reducing the associated risks. This has implications for clinical practice on how best to treat these patients.
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After experiencing a cardiac event, identifying and treating patients with anxiety and depression remains a challenge for healthcare providers. CR is a comprehensive program with specific guidelines which include psychological strategies to improve cardiac patients’ mental and physical well-being following a cardiac event (Ski et al., 2011). These clinical guidelines suggest the psychological needs of cardiac patients should be met. In clinical practice it is unclear how to successfully identify patients who are in most need of psychological help and once identified how best to treat them. Although in the qualitative study reported in this thesis a telephone invitation was successful at getting patients to attend, patients with psychological distress are at an increased risk of not completing CR. The first session of CR would be a good time to screen patients for depression and anxiety and refer them on to more specific services before there is a chance for these patients to drop out. This is an ideal opportunity to identify patients with depression and anxiety who attend CR. Although CR could be utilised as an opportunity to screen patients for the presence of depression and anxiety, this would not capture the patients who do not attend CR. This is a particularly important issue as depression has been reported in some studies as being a barrier to CR attendance (Glazer et al., 2002; Grace, McDonald, Fishman, & Caruso, 2005; Sanderson & Bittner, 2005; Yohannes et al., 2007). The most effective time to screen cardiac patients for anxiety and depression, to maximise capturing patients who may not attend CR, could be before hospital discharge. However, screening for depression and anxiety should also be
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part of a CR program, as this would capture patients who have developed symptoms since hospital discharge. Patients identified at any stage of recovery from a cardiac event should then be referred for specific mental health treatments, in addition to a program of CR. Having multiple opportunities to capture patients with depression and anxiety will enable these patients to be identified and receive the appropriate treatment to improve their recovery from a cardiac event.

In this thesis, a key finding from the qualitative study was receiving an invitation to attend CR by telephone was an effective facilitator for CR attendance. This was a simple, yet an effective method to get patients to attend. Likewise, not receiving a telephone call was a considerable barrier to non-attendance of CR. In some cases, this meant that patients who wanted to attend CR were unable to do so due to CR uptake being optimal, resulting in there not being enough spaces in the program to provide this service to all patients wanting to attend. Regular clinical audits could assess whether there are enough places to meet patient demands.

Conclusion

The strengths of this thesis were its use of broad range of methodologies to address three research aims exploring the relationship of depression and anxiety in the onset and recovery of CHD. One of the key outcomes of this thesis is the need to consider women’s and men’s heart disease separately as the relationships between CVD
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and depression and anxiety were found to be different. Future research should place more importance on gender-specific research when examining the effects of depression and anxiety on both the onset and recovery of heart disease.

It can be concluded that it is unlikely CR is an effective intervention for reducing depression and anxiety based on current evidence. More research using RCTs, and if RCTs are not practical then high-quality non-RCTs, are needed to examine effective interventions that could be used in addition to CR to treat patients with depression and anxiety. A major limitation found in the current data regarding psychological interventions is that these interventions are not targeting patients with clinically significant depression and anxiety, and future research needs to address this limitation to be able to develop effective interventions for patients.

Receiving a telephone invitation to CR was the most effective facilitator to CR attendance found in this thesis. This is a very simple and effective method to increase recruitment to CR services. However, identifying the most effective time or times to screen for anxiety and depression is less clear and should be researched further.

The role of depression and anxiety in both the onset and the recovery of CHD is unclear. The findings from this thesis suggest comorbid anxiety and depression are a risk for incident CHD only for women. In the recovery from a cardiac event, anxiety was found to have a dual role by increasing avoidant behaviours in some participants, but also enhancing positive behaviours in others. These findings suggest that specific symptoms
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of depression and anxiety may present more of a risk than others for both the onset and the recovery from CHD. Future research should explore this gap in current knowledge. The aim of future research should take a more holistic approach to treating both the physical and psychological recovery of cardiac patients. This knowledge will help develop alternative treatments that could be offered to suit the individual rather than one approach to suit all patients. Reducing the impact of depression and anxiety, through awareness campaigns and an improvement in identifying and treating individuals is an important goal for clinical practice, whether in a cardiac population or the general population.
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Appendices

Appendix A: 45 & Up Study Questionnaire

The 45 and Up Study Questionnaire for Women

General questions about you

1. What is your date of birth? [ ] Yes [ ] No

2. What is your age today? [ ] Yes [ ] No

3. How tall are you without shoes? [ ] Yes [ ] No

4. About how much do you weigh? [ ] Yes [ ] No

5. What is the highest level of study you have completed? [ ] Yes [ ] No

6. Are you of Aboriginal or Torres Strait Islander origin? [ ] Yes [ ] No

7. In which country were you born? [ ] Yes [ ] No

8. What year did you first come to live in Australia for one year or more? [ ] Yes [ ] No

9. What is your ancestry? [ ] Yes [ ] No

10. Do you speak a language other than English at home? [ ] Yes [ ] No

11. Have you ever been a regular smoker? [ ] Yes [ ] No

12. About how many alcoholic drinks do you have each week? [ ] Yes [ ] No

13. On how many days each week do you usually drink alcohol? [ ] Yes [ ] No
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14. What best describes your current situation? (PLEASE CROSS ONE BOX)
- Single
- Married
- Widowed
- Divorced
- Do not live with partner

15. What best describes your current housing? (PLEASE CROSS ONE BOX)
- House
- Apartment
- Mobile home
- Other

16. How many TIMES did you do each of these activities LAST WEEK? (PLEASE CROSS ONE BOX)
- Walking continuously, for at least 10 minutes (without stopping or sitting down)
- Vigorous physical activity (like running, swimming, or playing racquetball)
- Moderate physical activity (like walking, dancing, or gardening)

17. If you add up all the time you spent doing each activity LAST WEEK, how many minutes did you spend ALTOGETHER doing each type of activity? (PLEASE CROSS ONE BOX)
- Walking
- Vigorous physical activity
- Moderate physical activity

18. Have your mother, father, brothers, or sisters ever had:
- Heart disease
- Stroke
- High blood pressure
- Diabetes
- Breast cancer
- Colorectal cancer
- Lung cancer
- Ovarian cancer
- Prostate cancer
- Parkinson's disease
- Alzheimer's disease
- Severe depression
- Severe arthritis
- Hip fracture
- Other (please specify)

19. How many children have you given birth to? (PLEASE CROSS ONE BOX)
- Children
- Women

20. About how many hours a week are you exposed to someone else's tobacco smoke? (PLEASE CROSS ONE BOX)
- At home
- In other places (e.g., work, school, bars)

21. Have you ever used the pill or other hormonal contraceptives? (PLEASE CROSS ONE BOX)
- Yes
- No
- If yes, how long have you used hormonal contraceptives? (PLEASE CROSS ONE BOX)
- Years

22. Have you ever used hormone replacement therapy (HRT)? (PLEASE CROSS ONE BOX)
- Yes
- No
- If yes, how long have you used HRT? (PLEASE CROSS ONE BOX)
- Years

23. Have you taken any medications, vitamins, or supplements for most of the last 4 weeks, including HRT and the pill? (PLEASE CROSS ONE BOX)
- Yes
- No

Please list any other medications, vitamins, or supplements here.
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### 24. Has a doctor EVER told you that you have:
- [ ] skin cancer (not melanoma)
- [ ] melanoma
- [ ] breast cancer
- [ ] other cancer
- [ ] type of cancer (please describe)

**Age when condition was first found**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>skin cancer</td>
<td></td>
</tr>
<tr>
<td>melanoma</td>
<td></td>
</tr>
<tr>
<td>breast cancer</td>
<td></td>
</tr>
<tr>
<td>other cancer</td>
<td></td>
</tr>
<tr>
<td>type of cancer</td>
<td></td>
</tr>
</tbody>
</table>

### 26. Are you NOW suffering from any other important illness?
- [ ] Yes
- [ ] No

**Please describe this illness and its treatment**

### 27. Do you regularly need help with daily tasks because of long-term illness or disability? (Indicate any and give age where treatment started)

- [ ] Yes
- [ ] No

### 28. Does your health now LIMIT YOU in any of the following activities?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yes</th>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vigorous activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODERATE activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifting or carrying objects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climbing several flights of stairs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking one kilometre</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking one kilometre</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathing or dressing yourself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bending, kneeling or stooping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 29. Have you ever had any of the following operations?

<table>
<thead>
<tr>
<th>Operation</th>
<th>Yes</th>
<th>Age when had operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>removal of skin cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hysterectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>both ovaries removed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sterilisation (tubes tied)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>repair of prolapsed womb, bladder or bowel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knee replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hip replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gallbladder removed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>heart or coronary bypass surgery (include clefts and balloons)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Please describe any other operation you have had in the last 10 years, with your age when you had them**
### Questions about your diet

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>About how many times each week do you eat:</td>
<td>number of times-eaten each week</td>
</tr>
<tr>
<td></td>
<td>(please count all meals and snacks, put &quot;0&quot; if never eaten or eaten less than once a week)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- beef, lamb or pork</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- chicken, turkey or duck</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- processed meat (include bacon, sausage, salami, cheese, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- fish or seafood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- cheese</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>About how many of the following do you usually eat:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(please include meats, vegetables, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- bread or toast</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- bowls of breakfast cereal or oatmeal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- if you eat breakfast cereal it is usually:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- bran cereal (without toppings, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- biscuits (breakfast, afternoon snack, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- oat cereal (oatmeal, etc.)</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Which type of milk do you mostly drink?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- whole milk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- reduced fat milk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- low fat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- other (e.g. soymilk, rice milk, etc.)</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>About how many times of vegetables do you usually eat on each day?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(e.g. salad)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- number of servings of cooked vegetables each day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- number of servings of raw vegetables each day (e.g. salad)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- I don't eat vegetables</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>About how many times fruit or glasses of fruit juice do you usually have each day?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- a serving is 1 medium piece or 2 small pieces of 1 cup of juice (e.g. if you eat less than one a day)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- number of servings of fruit each day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- number of glasses of fruit juice each day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- I don't eat fruit</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Please put a cross in the box if you NEVER eat:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- red meat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- chicken/poultry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- pork/ham</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- dairy products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- any meat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- eggs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- sugar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- wheat products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- fish</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- seafood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- cream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- cheese</td>
<td></td>
</tr>
</tbody>
</table>

### Questions about time and work

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>What is your usual household income before tax, from all sources? (please include benefits, bonuses, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- less than $5,000 per year</td>
<td>$0 -8,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $5,000 - $9,999 per year</td>
<td>$9,000 - $14,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $10,000 - $19,999 per year</td>
<td>$15,000 - $24,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $20,000 - $29,999 per year</td>
<td>$25,000 - $34,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $30,000 - $39,999 per year</td>
<td>$35,000 - $44,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $40,000 - $49,999 per year</td>
<td>$45,000 - $54,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $50,000 - $69,999 per year</td>
<td>$55,000 - $64,999 per year</td>
</tr>
<tr>
<td></td>
<td>- $70,000 or more per year</td>
<td>$75,000 or more per year</td>
</tr>
<tr>
<td></td>
<td>- I would rather not answer this question</td>
<td></td>
</tr>
</tbody>
</table>
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

47. What is your current work status? (You can choose more than one box)
- In full time paid work
- In part time paid work
- Completely retired/pensioner
- Partially retired
- Disability/disability pensioner
- Other

48. If you are partially or completely retired, how old were you when you retired?
- □ years old

49. About how many HOURS each week do you usually spend doing the following? (Please put 0 if you do not spend any time doing it)
- Hours per week
  - □ paid work
  - □ voluntary/unpaid work

50. Which of the following do you have? (Including Medicare)
- Private health insurance – with extras
- Private health insurance – without extras
- Department of Veterans’ Affairs white or gold card
- Health care concession card
- None of these

51. What best describes the colour of your skin on the inside of your upper arm, that is your skin colour without any tanning?
- Very fair
- Light olive
- Brown
- Dark olive
- Black

52. What would happen if your skin was repeatedly exposed to bright sunlight during summer without any protection?
- Would it:
  - □ Get very tanned?
  - □ Get moderately tanned?
  - □ Never tan, or only get_tiny?

53. About how many hours a day would you usually spend outdoors on a weekday and on the weekend?
- Hours per day
  - □ Weekday
  - □ Weekend

54. About how many HOURS in each 24 hour DAY do you usually spend doing the following? (Please put 0 if you do not spend any time doing it)
- Hours per day
  - □ Sleeping (including all night & nap)
  - □ Sitting
  - □ Watching television
  - □ Using a computer
  - □ Standing

55. How many TIMES in the LAST WEEK did you:
- Spend time with friends or family who do not live with you?
- Talk to someone (friends, relatives or others) on the telephone?
- Go to meetings of social clubs, religious groups or other groups you belong to?
- □ Times

56. How many people outside your home, but within one hour of travel, do you feel you can depend on or feel very close to?
- □ People

57. During the past 4 weeks, how often did you feel:
- Frustrated or annoyed with things that normally could get you down?
- Hopeless?
- Restless or fidgety?
- So restless that you could not sit still?
- Depressed?
- That everything was an effort?
- So sad that nothing could cheer you up?
- Worthless?

58. During the past 4 weeks, have you had any of the following problems with your work or daily activities because of any emotional problems (such as being depressed or anxious)?
- □ Yes
- □ No

Thank you very much for filling in the questionnaire.

DON’T FORGET TO SIGN THE CONSENT FORM OVERLEAF

Are your name and address correct on the front of this questionnaire? □ Yes □ No

If INCORRECT, give details below:
Surname:
Given names:
Postal address:

Town or Suburb:
State or Territory: Postcode:
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

The 45 and Up Study relies on the willingness of people in New South Wales to share information about their lives and experiences and to have their health followed over time. By signing this form you are agreeing to take part in the 45 and Up Study and for the Study team to follow your health over time. Participation is completely voluntary, and you are free to ask questions or withdraw from the Study at any time, by calling the Study helpline on 1300 45 11 45.

More information on the Study can be found at www.45andup.org.au

I agree to have my health followed over time through:

the 45 and Up Study team following health and other records relating to me, including NSW hospital records, cancer records, death records and other health-related records, as outlined in the Study leaflet, The 45 and Up Study: Information for participants;

Medicare Australia releasing to the 45 and Up Study my enrolment details, including Medicare number; and information concerning services provided to me under Medicare, the Department of Veterans’ Affairs, the Pharmaceutical Benefits Scheme and the Repatriation Pharmaceutical Benefits Scheme, including past information, until the end of the Study or for the duration of my involvement in the Study;

being contacted in the future to provide information on changes to my health and lifestyle. I may also be asked to provide further information including questionnaire responses or biological samples; my participation in any of these would be completely voluntary.

I have been provided with information about the 45 and Up Study including how it will gather, store, use and disclose information about me, in the Study leaflet. I have been given an opportunity to ask questions and have been fully informed about the Study.

Name (Print): ____________________________

Signature: ____________________________ Date today: __________/____/20__

Extra contact details

It would be very helpful and reduce Study costs if we could contact you in future by email. If you are happy for us to do this, please write your email address here:

Email address: ____________________________

Sometimes we find that people have changed when we try to contact them again. It would be very helpful if you could give us your mobile phone number and/or the contact details of someone close to you (such as a relative or friend) who would be happy for us to contact them if we are unable to reach you. We would only get in touch with that person if we were unable to contact you directly and we would need to tell them our reason for contacting you. Please leave this section blank if you do not wish to provide these extra contact details.

Your home phone number: ____________________________

Your mobile phone number: ____________________________

Full name of contact person: ____________________________

Phone number of contact person: ____________________________

If you have any questions about the Study, please ring the Study helpline on 1300 45 11 45.

You can also write to or send your questionnaire (no stamp required) directly to:

Associate Professor Emily Banks, Scientific Director,

Thank you very much for taking part.

SAMPLE COPY
### Appendix B  ICD-10-AM codes Diagnostic codes

<table>
<thead>
<tr>
<th>Conditions</th>
<th>ICD-10-AM codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable angina</td>
<td>I20.0</td>
</tr>
<tr>
<td>Coronary artery bypass graft</td>
<td>38497, 38500, 38503, 90201</td>
</tr>
<tr>
<td>Coronary artery bypass angioplasty/stent;</td>
<td>35310, 38306, 35304-00, 30305-00, 38300-00', 38303-00</td>
</tr>
<tr>
<td>Coronary revascularisation procedures</td>
<td>35304-00, 30305-00, 38300-00, 38303-00</td>
</tr>
<tr>
<td>Stroke</td>
<td>G45, G46</td>
</tr>
</tbody>
</table>
Appendix C: CR Study Baseline Questionnaire

Cardiac Rehabilitation Study
The role of psychological distress on the decision to attend cardiac rehabilitation

We are interested in evaluating your views of cardiac rehabilitation services. In order to do this, we would like you to fill out this brief questionnaire.

Instructions

Please answer all questions.
Please read the instructions before each set of questions very carefully.
There are no right or wrong answers, just choose the answer that most applies to you.
Please give your most honest answer so that we can get an accurate understanding of your experience.
Everything you say will be kept in total confidence.
Space is provided at the end of the questionnaire for any other comments you may wish to add.
The questionnaire will take approximately 15 minutes to complete.

If you find any of the questions unsettling, or find that they raise issues you had not previously considered, please feel free to contact the Researcher Caroline Joyce; caroline.joyce@uws.edu.au or 02 9772 6781

Your participation in this research is greatly appreciated.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

General questions about you:

1. What age were you last birthday? [ ] (in years)

2. Please tick whether you are female or male: [ ] Female [ ] Male

3. a) What were you in hospital for?
   (please write here what you were admitted to hospital for)

   b) What date were you discharged from hospital?

4. Do you have any other illnesses or conditions that you are currently being treated for?

5. What is your marital status?
   (Please tick the relevant answer)
   [ ] Single
   [ ] Married/living with partner
   [ ] Separated/Divorced
   [ ] Widowed
   Other please specify:

6. Are you of Aboriginal or Torres Strait Islander descent?
   [ ] No
   [ ] Yes, aboriginal
   [ ] Yes, Torres Strait Islander

7. In which country were you born?
   (please tick the appropriate box)
   [ ] Australia   [ ] UK   [ ] Ireland
   [ ] Lebanon   [ ] Greece   [ ] Germany
   [ ] India   [ ] Malta   [ ] Netherlands
   [ ] Philippines   [ ] Vietnam   [ ] Italy
   [ ] China   [ ] New Zealand
   Other, please specify:

8. What is your current employment status?
   [ ] Employed   [ ] Unemployed
   [ ] Retired   [ ] Homemaker
   Other, please specify:

9. If employed when do you expect to return to work?

10. What is the highest level of education you have completed?
    [ ] No school certificate or other qualifications
    [ ] School or intermediate certificate (or equivalent)
    [ ] Higher school or leaving certificate (or equivalent)
    [ ] Trade/apprenticeship (e.g. hairdresser, chef)
    [ ] Certificate/diploma (e.g. child care, technician)
    [ ] University degree or higher

11. What is your usual yearly HOUSEHOLD income before tax from all sources?
    (please include benefits, pensions, superannuation, etc.)
    [ ] Less than $5,000 a year
    [ ] $5,000 - $9,999
    [ ] $10,000 - $19,999
    [ ] $20,000 - $29,999
    [ ] $30,000 - $39,999
    [ ] $40,000 - $49,999
    [ ] $50,000 - $59,999
    [ ] $60,000 - $69,999
    [ ] $70,000 or more

12. How tall are you, without your shoes on?
    (Please give to nearest cm or inch)
    [ ] cm   [ ] Feet   [ ] Inches

13. About how much do you weigh?
    [ ] Kg   [ ] Lbs   [ ] Ounces

14. Have you ever been a regular smoker?
    [ ] No (If you answered no to please go to question 15)
    [ ] Yes (please answer the following)
    a) How old were you when you started smoking regularly?
       [ ] years old
    b) Are you a regular smoker now?
       [ ] Yes
       [ ] No
    c) No - how old were you when you stopped smoking regularly?
       [ ] years old
    d) About how much do/did you smoke on average each day
       (if you are an ex-smoker, how much did you smoke on average when you smoked?)
       [ ] cigarettes per day
       [ ] Pipes or cigars per day
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

15. About how many alcoholic drinks do you have each week?
   One drink = a glass of wine, middy of beer or nip of spirits.
   (Put “0” if you do not drink, or have less than one drink each week)
   
16. On how many days each week do you usually drink alcohol?
   Days each week

17. Have you ever been told by a doctor you have depression and/or anxiety?
   □ Yes
   □ No
   □ Unsure
   If yes, what condition were you told you had:

18. Have you ever been treated for depression and/or anxiety?
   □ Yes
   □ No
   □ Unsure
   If yes, what condition were you told you had:

19. Are you currently being treated for depression and/or anxiety?
   □ Yes
   □ No
   □ Unsure
   If yes, what is the condition you are being treated for:

20. Has your father, mother, brother, sister (blood relative) ever had heart disease?
   □ Yes
   □ No
   □ Unsure
   If yes, what condition were they told they had:

21. Has your father, mother, brother, sister (blood relative) ever had depression and/or anxiety?
   □ Yes
   □ No
   □ Unsure
   If yes, what condition were they told they had:

22. Are you planning to attend cardiac rehabilitation?
   □ Yes
   □ No
   □ Unsure

23. Where did you hear about cardiac rehabilitation?

24. Before becoming ill, how many times each week would you do the following activities?
   (Put “0” if you did not do this activity)
   (Put “0” if you did not do this activity)
   □ Walking continuously, for at least 10 mins
     (for recreation or exercise or to get to or from places)
   □ Moderate physical activity
     (like gentle swimming, social tennis, vigorous gardening or work around the house)
   □ Vigorous physical activity
     (that made you breathe harder or puff and pant, like jogging, cycling, aerobics, but not household chores or gardening)
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

<table>
<thead>
<tr>
<th>25. I feel tense or 'wound up':</th>
<th>32. I feel as if I am slowed down:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Most of the time</td>
<td>☐ Nearly all the time</td>
</tr>
<tr>
<td>☐ A lot of the time</td>
<td>☐ Very often</td>
</tr>
<tr>
<td>☐ From time to time, occasionally</td>
<td>☐ Sometimes</td>
</tr>
<tr>
<td>☐ Not at all</td>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>26. I still enjoy the things I used to enjoy:</th>
<th>33. I get a sort of frightened feeling like 'butterflies' in the stomach:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Definitely as much</td>
<td>☐ Not at all</td>
</tr>
<tr>
<td>☐ Not quite so much</td>
<td>☐ Occasionally</td>
</tr>
<tr>
<td>☐ Only a little</td>
<td>☐ Quite often</td>
</tr>
<tr>
<td>☐ Hardly at all</td>
<td>☐ Very often</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>27. I get a sort of frightened feeling as if something awful is about to happen:</th>
<th>34. I have lost interest in my appearance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Very definitely and quite badly</td>
<td>☐ Definitely</td>
</tr>
<tr>
<td>☐ Yes, but not badly</td>
<td>☐ I don't take as much care as I should</td>
</tr>
<tr>
<td>☐ A little, but it does not worry me</td>
<td>☐ I may not take quite as much care</td>
</tr>
<tr>
<td>☐ Not at all</td>
<td>☐ I take just as much care as ever</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>28. I can laugh and see the funny side of things:</th>
<th>35. I feel restless as if I have to be on the move:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ As much as I always could</td>
<td>☐ Very much indeed</td>
</tr>
<tr>
<td>☐ Not quite so much now</td>
<td>☐ Quite a lot</td>
</tr>
<tr>
<td>☐ Definitely not so much now</td>
<td>☐ Not very much</td>
</tr>
<tr>
<td>☐ Not at all</td>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>29. Worrying thoughts go through my mind:</th>
<th>36. I look forward with enjoyment to things:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ A great deal of the time</td>
<td>☐ As much as I ever did</td>
</tr>
<tr>
<td>☐ A lot of the time</td>
<td>☐ Rather than I used to</td>
</tr>
<tr>
<td>☐ From time to time, but not too often</td>
<td>☐ Definitely less than I used to</td>
</tr>
<tr>
<td>☐ Only occasionally</td>
<td>☐ Hardly at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>30. I feel cheerful:</th>
<th>37. I get sudden feelings of panic:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Not at all</td>
<td>☐ Very often indeed</td>
</tr>
<tr>
<td>☐ Not often</td>
<td>☐ Quite often</td>
</tr>
<tr>
<td>☐ Sometimes</td>
<td>☐ Not very often</td>
</tr>
<tr>
<td>☐ Most of the time</td>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>31. I can sit at ease and feel relaxed:</th>
<th>38. I can enjoy a good book or radio or TV program:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Definitely</td>
<td>☐ Often</td>
</tr>
<tr>
<td>☐ Usually</td>
<td>☐ Sometimes</td>
</tr>
<tr>
<td>☐ Not often</td>
<td>☐ Not often</td>
</tr>
<tr>
<td>☐ Not at all</td>
<td>☐ Very seldom</td>
</tr>
</tbody>
</table>
## ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

### Your views about your heart disease

We are interested in your personal views of how you now see your current heart disease. Please indicate how much you agree or disagree with the following statements about your illness by circling the appropriate response for every question.

<table>
<thead>
<tr>
<th>Views about your heart disease</th>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neither agree nor disagree (N)</th>
<th>Agree (A)</th>
<th>Strongly Agree (SA)</th>
<th>Views about your heart disease</th>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neither agree nor disagree (N)</th>
<th>Agree (A)</th>
<th>Strongly Agree (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>39. My heart disease will last a short time</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>59. My treatment will be effective in curing my heart disease</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>40. My heart disease is likely to be permanent rather than temporary</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>60. The negative effects of my heart disease can be prevented (avoided) by my treatment</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>41. My heart disease will last a long time</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>61. My treatment can control my illness</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>42. My heart disease will pass quickly</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>62. There is nothing which can help my condition</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>43. I expect to have heart disease for the rest of my life</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>63. The symptoms of my condition are puzzling to me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>44. My heart disease is a serious condition</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>64. My heart disease is a mystery to me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>45. My heart disease has major consequences on my life</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>65. I don’t understand my heart disease</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>46. My heart disease does not have much effect on my life</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>66. My heart disease doesn’t make any sense to me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>47. My heart disease strongly affects the way others see me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>67. I have a clear picture or understanding of my condition</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>48. My heart disease has serious financial consequences</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>68. The symptoms of my heart disease change a great deal from day to day</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>49. My heart disease causes difficulties for those who are close to me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>69. My symptoms come and go in cycles</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>50. There is a lot which I can do to control my symptoms</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>70. My heart disease is very unpredictable</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>51. What I do can determine whether my heart disease gets better or worse</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>71. I go through cycles in which my heart disease gets better or worse</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>52. The course of my heart disease depends on me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>72. I get depressed when I think about my heart disease</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>53. Nothing I do will affect my illness</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>73. When I think about my heart disease I get upset</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>54. I have the power to influence my illness</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>74. My heart disease makes me feel angry</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>55. My actions will have no effect on the outcome of my heart disease</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>75. My heart disease does not worry me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>56. My heart disease will improve in time</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>76. Having this heart disease makes me feel anxious</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>57. There is very little that can be done to improve my heart disease</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>77. My heart disease makes me feel afraid</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
</tbody>
</table>
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

<table>
<thead>
<tr>
<th>Causes of my heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are interested in what you consider may have been the cause of your heart disease. We are most interested in your own views about the factors that caused your illness rather than what others including doctors or family may have suggested to you. Below is a list of possible causes of your illness. (Please circle a response for every question)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>Strongly disagree</th>
<th>Neither agree nor disagree</th>
<th>Strongly agree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress or worry</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Hereditary - it runs in my family</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>A germ or virus</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Diet or eating habits</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Chance or bad luck</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Altered immunity</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Pollution in the environment</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>My own behaviour</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>Family problem or worries caused my illness</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
</tbody>
</table>

In the table below please list in rank order the three most important factors that you believe caused YOUR heart disease. You may use any items from the section above to answer this question, or you may have additional ideas of your own.

The most important causes for me:

1. 

2. 

3. 

Your views about your illness

Listed below are a number of symptoms that you may or may not have experienced since your heart disease. Please indicate by circling Yes or No, whether you have experienced any of these symptoms since your heart disease. If you have please go on to answer whether you believe that these symptoms are related to your heart disease.

<table>
<thead>
<tr>
<th>I have experienced this symptom since my heart disease</th>
<th>If yes, please answer</th>
<th>This symptom is related to my heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Sore throat</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Nausea</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Weight loss</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Fatigue</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Stiff joints</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Sore eyes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Wheeziness</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Headaches</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Upset stomach</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Sleep difficulties</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Dizziness</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Loss of strength</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain</th>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sore throat</td>
<td>Yes</td>
<td>No</td>
<td>Don't know</td>
</tr>
<tr>
<td>Nausea</td>
<td>Yes</td>
<td>No</td>
<td>Don't know</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>Yes</td>
<td>No</td>
<td>Don't know</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Yes</td>
<td>No</td>
<td>Don't know</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Stiff joints</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Sore eyes</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Wheeziness</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Headaches</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Upset stomach</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Sleep difficulties</td>
<td>No</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Dizziness</td>
<td>No</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
<tr>
<td>Loss of strength</td>
<td>Yes</td>
<td>Yes</td>
<td>Don't know</td>
</tr>
</tbody>
</table>
## Your views about cardiac rehabilitation

We are interested in your personal views about cardiac rehabilitation programs. Please indicate how much you agree or disagree with the following statements about cardiac rehabilitation, (please circle one response for each question).

<table>
<thead>
<tr>
<th></th>
<th>strongly disagree (SD)</th>
<th>disagree (D)</th>
<th>neither agree nor disagree (N)</th>
<th>agree (A)</th>
<th>strongly agree (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110. Attending cardiac rehabilitation may help the long-term recovery of my heart condition</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>111. I have a clear picture of how cardiac rehabilitation will help the health of my heart</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>112. Some aspects of the cardiac rehabilitation program are unnecessary for me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>113. I have a clear picture of what I want to achieve by attending cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>114. I hope that attending cardiac rehabilitation may help me to return to work more quickly</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>115. I am worried that some aspects such as exercise may be harmful to me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>116. Availability of transport will influence my decision to attend cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>117. The cost of transport may prevent me from attending cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>118. I may not feel physically fit enough to attend cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>119. I am worried that I may not be able to keep up with the exercise part</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>120. It would be financially difficult to take time off work to attend cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>121. Cardiac rehabilitation is probably more suitable for people who have been previously active</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>122. Younger people are more likely to benefit from cardiac rehabilitation than older less active people</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
</tbody>
</table>

### Other comments

If you have any other comments, positive or negative, that you feel are important for the purpose of this study, please feel free to write them in the space provided below.

---

If you are concerned about feelings of depression or anxiety, please arrange to speak with your treating team, your General Practitioner (GP) or if it is urgent you can contact LIFELINE at any time on 13 11 14. You can also contact the UWS Psychology Clinic which offers free treatment of psychological disorders on (02) 4645 7241 or Email: psychclinic@uws.edu.au.

Thank you for taking the time to complete this questionnaire.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Appendix C: Patient Information Sheet

PARTICIPANT INFORMATION SHEET AND CONSENT FORM

The role of psychological distress in the decision to attend cardiac rehabilitation

Invitation
You are invited to participate in a research study into how people make the decision to attend cardiac rehabilitation programs.

The study is being conducted by Caroline Joyce a PhD candidate from the University of Western Sydney.

Before you decide whether or not you wish to participate in this study, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

What is the purpose of the study?
The purpose is to achieve a greater understanding of how relevant people believe Cardiac Rehabilitation is to their recovery from a heart attack. This study will evaluate your views by asking you about what your expectations are of a Cardiac Rehabilitation program and whether you will attend. It will also ask you about how you are feeling and what you understand about your heart disease.

Why have I been invited to participate in this study?
You are eligible to participate in this study because you are a person who has recently been diagnosed with a heart condition and we are interested in your views about cardiac rehabilitation.

What if I don’t want to take part in this study, or if I want to withdraw later?
Participation in this study is voluntary. It is completely up to you whether or not you participate. If you decide not to participate, it will not affect the treatment you receive now or in the future. Whatever your decision, it will not affect your relationship with the staff caring for you.

If you wish to withdraw from the study once it has started, you can do so at any time without having to give reason.

What does this study involve?
If you agree to participate in this study, you will be asked to sign the Participant Consent Form and complete a questionnaire and send it back to the researcher in the replied mail envelope provided with the questionnaire. If you would prefer you can complete the questionnaire online at http://tinyurl.com/CardiacRehabilitationStudy.

You will also be asked to complete a further contact sheet so we can send you a follow-up questionnaire at six months to see if your emotions and perceptions about your heart disease and cardiac rehabilitation have changed.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

We will also ask you for your permission to contact your local cardiac rehabilitation services to see what services you accessed. You are under no obligation to answer this question. Your answer to this question will not affect your treatment now or in the future.

How is this study being paid for?
This study is to be part of a PhD thesis and student is not being funded by any organisation, although it is in receipt of scholarship which is funded by the Australian Postgraduate Award.

Are there any risks to me taking part in this study?
Discussing issues about your health and treatment can be difficult and has the potential to raise personal concerns. The researcher is particularly sensitive to the ethical issues in this study, and will ensure the ethical conduct of all aspects of the research. If you find any of the questions unsettling, or find that they raise issues you had not previously considered, please feel free to contact Caroline Joyce, (02) 9772 6781, or Caroline.Joyce@uws.edu.au.

If participation in this study causes you to become distressed or if you are concerned about feelings of depression or anxiety, please arrange to speak with your treating team, your General Practitioner (GP) or if it is urgent you can contact LIFELINE at any time on 13 11 14. You can also contact the UWS Psychology Clinic which offers free treatment of psychological disorders on (02) 4645 7241 or Email: psych clinic@uws.edu.au.

Will I benefit from the study?
This study aims to further medical knowledge and may improve future treatment provided by cardiac rehabilitation services; however it may not directly benefit you.

Will taking part in this study cost me anything, and will I be paid?
Participation in this study will not cost you anything.

How will my confidentiality be protected?
Of the people treating you, only Caroline Joyce will know whether or not you are participating in this study. Any identifiable information that is collected about you in connection with this study will remain confidential and will be disclosed only with your permission, or except as required by law. Only the researchers named above will have access to your details and results that will be held securely at the University of Western Sydney.

What happens with the results?
If you give us your permission by signing the consent form, we plan to publish the results to Campbelltown Hospital in order to facilitate broader understanding of how people make the decision to attend cardiac rehabilitation. It is also intended to publish results of this study in peer-reviewed journals, and present the results at conferences.

In any publication, information will be provided in such a way that you cannot be identified. Results of the study will be provided to you, if you wish.

What should I do if I want to discuss this study further before I decide?
When you have read this information, the researcher Caroline Joyce will discuss it with you and any queries you may have. If you would like to know more at any stage please do not hesitate to contact her on 02 9772 6417 or Caroline.Joyce@uws.edu.au.

Who should I contact if I have concerns about the conduct of this study?
This study has been approved by South Western Sydney Local Health District Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this study should contact the Ethics and Research Governance Office, SWSLHD Locked Bag 7017, LIVERPOOL, 2171 on 02 8738 8304, fax 02 8738 8310 or email research.support@swwhs.nsw.gov.au and quote 12/067c.
CONSENT FORM

The role of psychological distress upon the decision to attend cardiac rehabilitation

1. I acknowledge that I have read the participant information statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.

2. I understand that I can withdraw from the study at any time without prejudice to my relationship with the Campbelltown Hospital.

3. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.

4. I understand that if I have any questions relating to my participation in this research, I may contact Caroline Joyce on telephone 9772 6417 or Caroline.Joyce@uws.edu.au, who will be happy to answer them.

I acknowledge receipt of a copy of this Consent Form and the Participant Information Statement.

This study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this study should contact the Ethics and Research Governance Office, SWSLHD Locked Bag 7017, Liverpool, NSW, 1871 or 02 9798 9304, fax 02 9798 9310 or email xoxocx and quote [HREC project number].

[Signature of participant] Please PRINT name Date [or person responsible] (insert or delete as necessary)

[Signature of witness] Please PRINT name Date

[Signature of investigator] Please PRINT name Date

Do you give permission for the researcher (Caroline Joyce) to contact Cardiac Rehabilitation Services to ask if you attended a Cardiac Rehabilitation program? (please tick the relevant box, by ticking either box will not affect your now or in the future)

☐ Yes I give my permission

☐ No I do not give my permission
Appendix D: CR Study Follow Up Questionnaire

The role of psychological distress on the decision to attend cardiac rehabilitation

We are interested in evaluating your views of cardiac rehabilitation services. This is a follow up questionnaire to see if your views have changed over time, some of the questions may be familiar from the first questionnaire you completed. Please answer all questions with how you feel now.

Instructions

Please answer all questions.
Please read the instructions before each set of questions very carefully.
There are no right or wrong answers, just choose the answer that most applies to you.
Please give your most honest answer so that we can get an accurate understanding of your experience.
Everything you say will be kept in total confidence.
Space is provided at the end of the questionnaire for any other comments you may wish to add.
The questionnaire will take approximately 15 minutes to complete.

If you find any of the questions unsettling, or find that they raise issues you had not previously considered, please feel free to contact the Researcher Caroline Joyce; caroline.joyce@uws.edu.au or 02 9772 6781

Your participation in this research is greatly appreciated.
General questions:

1. Are you attending or have you attended cardiac rehabilitation?
   □ Yes
   □ No
   Other please specify: _________________________________________________

2. How many sessions of cardiac rehabilitation have you attended?
   _________________________________________________________________

3. If you attend cardiac rehabilitation has your program finished?
   □ Yes
   □ No

4. Since leaving hospital after your initial cardiac event have you been readmitted to hospital?
   □ No
   □ Yes (if yes, please state how many times you have been readmitted and what it was for)

5. If you are employed, have you returned to work?
   □ Yes
   □ No
   Other, please specify: _______________________________________________

6. If yes, did attending cardiac rehabilitation help you return to work?
   □ Yes
   □ No

7. About how much do you weigh?
   Kg OR Lbs OR Ounces

8. Have you ever been a regular smoker?
   □ No (If you answered no to please go to question 9)
   □ Yes (please answer the following)
   a) How old were you when you started smoking regularly?
      years old
   b) Are you a regular smoker now? □ Yes □ No
   c) No - how old were you when you stopped smoking regularly?
      years old
   d) About how much do/did you smoke on average each day (if you are an ex-smoker, how much did you smoke on average when you smoked?)
      cigarettes per day
      Pipes or cigars per day

9. About how many alcoholic drinks do you have each week?
   One drink = a glass of wine, middy of beer or nip of spirits.
   (Put "0" if you do not drink, or have less than one drink each week) __________

10. On how many days each week do you usually drink alcohol?
    □ Days each week

11. Have you ever been treated for depression and/or anxiety?
    □ Yes
    □ No
    □ Unsure
    If yes, what condition were you told you had:
    _______________________________________________________________
    How old were you? __________

12. Are you currently being treated for depression and/or anxiety?
    □ Yes
    □ No
    □ Unsure
    If yes, what is the condition you are being treated for:
    _______________________________________________________________
    How long have you been treated for this condition?
    _______________________________________________________________
    What treatment are you receiving?
    _______________________________________________________________

13. How many times each week would you do the following activities?
    (Put "0" if you did not do this activity)
    □ Walking continuously, for at least 10 mins
    (for recreation or exercise or to get to or from places)
    □ Moderate physical activity
    (like gentle swimming, social tennis, vigorous gardening or work around the house)
    □ Vigorous physical activity
    (that made you breathe harder or puff and pant, like jogging, cycling, aerobics, but not household chores or gardening)
<table>
<thead>
<tr>
<th><strong>Aspects of your life generally</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The following questions ask about how you feel about aspects of your life, generally. Please read each item and tick the reply that comes closest to how you have been feeling in the PAST WEEK. Give your immediate response; avoid thinking too long about your answers. Please answer the questions below with regard to yourself.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14. I feel tense or ‘wound up’:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Most of the time</td>
</tr>
<tr>
<td>☐ A lot of the time</td>
</tr>
<tr>
<td>☐ From time to time, occasionally</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15. I still enjoy the things I used to enjoy:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Definitely as much</td>
</tr>
<tr>
<td>☐ Not quite so much</td>
</tr>
<tr>
<td>☐ Only a little</td>
</tr>
<tr>
<td>☐ Hardly at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16. I get a sort of frightened feeling as if something awful is about to happen:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Very definitely and quite badly</td>
</tr>
<tr>
<td>☐ Yes, but not badly</td>
</tr>
<tr>
<td>☐ A little, but it does not worry me</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. I can laugh and see the funny side of things:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ As much as I always could</td>
</tr>
<tr>
<td>☐ Not quite so much now</td>
</tr>
<tr>
<td>☐ Definitely not so much now</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>18. Worrying thoughts go through my mind:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ A great deal of the time</td>
</tr>
<tr>
<td>☐ A lot of the time</td>
</tr>
<tr>
<td>☐ From time to time, but not too often</td>
</tr>
<tr>
<td>☐ Only occasionally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19. I feel cheerful:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Not at all</td>
</tr>
<tr>
<td>☐ Not often</td>
</tr>
<tr>
<td>☐ Sometimes</td>
</tr>
<tr>
<td>☐ Most of the time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>20. I can sit at ease and feel relaxed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Definitely</td>
</tr>
<tr>
<td>☐ Usually</td>
</tr>
<tr>
<td>☐ Not often</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>21. I feel as if I am slowed down:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Nearly all the time</td>
</tr>
<tr>
<td>☐ Very often</td>
</tr>
<tr>
<td>☐ Sometimes</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>22. I get a sort of frightened feeling like ‘butterflies’ in the stomach:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Not at all</td>
</tr>
<tr>
<td>☐ Occasionally</td>
</tr>
<tr>
<td>☐ Quite often</td>
</tr>
<tr>
<td>☐ Very often</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>23. I have lost interest in my appearance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Definitely</td>
</tr>
<tr>
<td>☐ I don’t take as much care as I should</td>
</tr>
<tr>
<td>☐ I may not take quite as much care</td>
</tr>
<tr>
<td>☐ I take just as much care as ever</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24. I feel restless as if I have to be on the move:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Very much indeed</td>
</tr>
<tr>
<td>☐ Quite a lot</td>
</tr>
<tr>
<td>☐ Not very much</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>25. I look forward with enjoyment to things:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ As much as I ever did</td>
</tr>
<tr>
<td>☐ Rather less than I used to</td>
</tr>
<tr>
<td>☐ Definitely less than I used to</td>
</tr>
<tr>
<td>☐ Hardly at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>26. I get sudden feelings of panic:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Very often indeed</td>
</tr>
<tr>
<td>☐ Quite often</td>
</tr>
<tr>
<td>☐ Not very often</td>
</tr>
<tr>
<td>☐ Not at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>27. I can enjoy a good book or radio or TV program:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Often</td>
</tr>
<tr>
<td>☐ Sometimes</td>
</tr>
<tr>
<td>☐ Not often</td>
</tr>
<tr>
<td>☐ Very seldom</td>
</tr>
</tbody>
</table>
### Your views about your heart disease

We are interested in your personal views of how you now see your current heart disease. Please indicate how much you agree or disagree with the following statements about your illness by circling the appropriate response for every question.

<table>
<thead>
<tr>
<th>views about your heart disease</th>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neither agree nor disagree (N)</th>
<th>Agree (A)</th>
<th>Strongly Agree (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. My heart disease will last a short time</td>
<td>SD D N A SA</td>
<td>47. My treatment will be effective in curing my heart disease</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. My heart disease is likely to be permanent rather than temporary</td>
<td>SD D N A SA</td>
<td>48. The negative effects of my heart disease can be prevented (avoided) by my treatment</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. My heart disease will last a long time</td>
<td>SD D N A SA</td>
<td>49. My treatment can control my illness</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. My heart disease will pass quickly</td>
<td>SD D N A SA</td>
<td>50. There is nothing that can help my condition</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. I expect to have heart disease for the rest of my life</td>
<td>SD D N A SA</td>
<td>51. The symptoms of my condition are puzzling to me</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. My heart disease is a serious condition</td>
<td>SD D N A SA</td>
<td>52. My heart disease is a mystery to me</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. My heart disease has major consequences on my life</td>
<td>SD D N A SA</td>
<td>53. I don’t understand my heart disease</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. My heart disease does not have much effect on my life</td>
<td>SD D N A SA</td>
<td>54. My heart disease doesn’t make any sense to me</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. My heart disease strongly affects the way others see me</td>
<td>SD D N A SA</td>
<td>55. I have a clear picture or understanding of my condition</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. My heart disease has serious financial consequences</td>
<td>SD D N A SA</td>
<td>56. The symptoms of my heart disease change a great deal from day to day</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. My heart disease causes difficulties for those who are close to me</td>
<td>SD D N A SA</td>
<td>57. My symptoms come and go in cycles</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. There is a lot which I can do to control my symptoms</td>
<td>SD D N A SA</td>
<td>58. My heart disease is very unpredictable</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. What I do can determine whether my heart disease gets better or worse</td>
<td>SD D N A SA</td>
<td>59. I go through cycles in which my heart disease gets better or worse</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. The course of my heart disease depends on me</td>
<td>SD D N A SA</td>
<td>60. I get depressed when I think about my heart disease</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Nothing I do will affect my illness</td>
<td>SD D N A SA</td>
<td>61. When I think about my heart disease I get upset</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. I have the power to influence my illness</td>
<td>SD D N A SA</td>
<td>62. My heart disease makes me feel angry</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. My actions will have no affect on the outcome of my heart disease</td>
<td>SD D N A SA</td>
<td>63. My heart disease does not worry me</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. My heart disease will improve over time</td>
<td>SD D N A SA</td>
<td>64. Having this heart disease makes me feel anxious</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. There is very little that can be done to improve my heart disease</td>
<td>SD D N A SA</td>
<td>65. My heart disease makes me feel afraid</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

<table>
<thead>
<tr>
<th>Causes of my heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are interested in what you consider may have been the cause of your heart disease. We are most interested in your own views about the factors that caused your illness rather than what others including doctors or family may have suggested to you. Below is a list of possible causes of your illness. <em>Please circle a response for every question.</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>Strongly disagree (SD)</th>
<th>disagree (D)</th>
<th>Neither agree nor disagree (N)</th>
<th>Strongly agree (SA)</th>
<th>(A) agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>70. Stress or worry</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. Hereditary - it runs in my family</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73. A germ or virus</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74. Diet or eating habits</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75. Chance or bad luck</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76. Altered immunity</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77. Pollution in the environment</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78. My own behaviour</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79. Family problems or worries caused my illness</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80. Overwork</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81. My mental attitude e.g. thinking about life negatively</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82. Alcohol</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83. Smoking</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84. Accident or injury</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85. My personality</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86. Poor medical care in my past</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87. Ageing</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88. My emotional state e.g. feeling down, lonely, anxious, empty</td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the table below please list in rank order the three most important factors that you believe caused YOUR heart disease. You may use any items from the section above to answer this question, or you may have additional ideas of your own.

The most important causes for me:

1. 

2. 

3. 

<table>
<thead>
<tr>
<th>Your views about your illness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed below are a number of symptoms that you may or may not have experienced since your heart disease. Please indicate by circling Yes or No, whether you have experienced any of these symptoms since your heart disease. If you have please go on to answer whether you believe that these symptoms are related to your heart disease.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have experienced this symptom since my heart disease</th>
<th>If yes, please answer</th>
<th>This symptom is related to my heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>89. Pain</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>90. Sore throat</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>91. Nausea</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>92. Breathlessness</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>93. Weight loss</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>94. Fatigue</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>95. Stiff joints</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>96. Sore eyes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>97. Wheeziness</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>98. Headaches</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>99. Upset stomach</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>100. Sleep difficulties</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>101. Dizziness</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>102. Loss of strength</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

### Your views about cardiac rehabilitation

We are interested in your personal views about cardiac rehabilitation programs. Please indicate how much you agree or disagree with the following statements about cardiac rehabilitation, (please circle one response for each question).

<table>
<thead>
<tr>
<th>Statement</th>
<th>strongly disagree (SD)</th>
<th>disagree (D)</th>
<th>neither agree nor disagree (N)</th>
<th>agree (A)</th>
<th>strongly agree (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>103. Attending cardiac rehabilitation may help the long-term recovery of my heart condition</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>104. I have a clear picture of how cardiac rehabilitation will help the health of my heart</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>105. Some aspects of the cardiac rehabilitation program are unnecessary for me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>106. I have a clear picture of what I want to achieve by attending cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>107. I hope that attending cardiac rehabilitation may help me to return to work more quickly</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>108. I am worried that some aspects such as exercise may be harmful to me</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>109. Availability of transport will influence my decision to attend cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>110. The cost of transport may prevent me from attending cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>111. I may not feel physically fit enough to attend cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>112. I am worried that I may not be able to keep up with the exercise part</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>113. It would be financially difficult to take time off work to attend cardiac rehabilitation</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>114. Cardiac rehabilitation is probably more suitable for people who have been previously active</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>115. Younger people are more likely to benefit from cardiac rehabilitation than older less active people</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
</tbody>
</table>

### Other comments

If you have any other comments, positive or negative, that you feel are important for the purpose of this study, please feel free to write them in the space provided below.

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If you are concerned about feelings of depression or anxiety, please arrange to speak with your treating team, your General Practitioner (GP) or if it is urgent you can contact LIFELINE at any time on 13 11 14. You can also contact the UWS Psychology Clinic which offers free treatment of psychological disorders on (02) 4645 7241 or Email: psychclinic@uws.edu.au.

Thank you for taking the time to complete this questionnaire.
ANXIETY, DEPRESSION AND CORONARY HEART DISEASE

Appendix E: Interview Schedule

Interview Schedule: Cardiac Rehabilitation

General questions about heart disease and overall psychological distress

1. Can you tell me how life has been for you since you had your heart attack (relevant condition from questionnaire)?
2. Can you tell me how you have been feeling emotionally since you had your heart attack (relevant condition)?
3. Can you tell me, do you feel different from how you felt before you had your heart attack?
   Prompt, how is this making you feel, how has this affected your mood.
   Ask about stress, anxiety, depression and mood if hasn’t been mentioned before.
4. What do you feel could have possibly caused your heart disease? Prompt, if on questionnaire have history of depression/anxiety ask whether they feel this could have contributed to their heart disease. Even if they didn’t report having a history might be worth probing further to see if they have had any anxiety or depression.
   Prompt, if answered that they feel distress did contribute ask whether they feel they are receiving support or have addressed the depression/anxiety.

Questions about Cardiac Rehabilitation general

5. Casting your mind back can you remember when cardiac rehabilitation was first mentioned to you?
   Prompt, may not have known about CR, need to ask if they had have known would they have attended, how they felt about not knowing.
6. Can you tell me what you initially understood cardiac rehabilitation programs were all about?
   Did you think it was for everyone, did you think it was relevant for you and your condition?
7. Can you tell me what your initial thoughts and feelings were about cardiac rehabilitation?
   Prompt, did these thoughts and feeling change, what did your family think about it, how important did you think it was, have these thoughts change, if so how. Did you think this was a positive of negative thing?
   Can you tell me, can you remember what your mood was like around this time?
8. Can you remember how you feeling at this time?
9. Prompt, how was your mood around this time?
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10. DO you think your mood at the time made any difference to your decision to attend CR or not. Prompt do you think that if you were in a better mood there wouldn’t have been so many obstacles?

Questions for people who only attended CR
11. I can tell from your questionnaire that you have started CR/that you have completed/ At the point you made that decision to attend can you remember how were feeling? Prompt; Did you think you have made the right decision?
12. What is/was the most important reason for you to attend cardiac rehabilitation?  
   Prompt, for health and recovery, work.
13. What is/was the most important part of cardiac rehabilitation for you?  
   Prompt: Ask whether they felt there was enough support for a person’s psychological wellbeing.
14. Can you tell me whether the cardiac rehabilitation program was what you expected it to be?
15. Can you tell me whether attending CR has changed the way you feel about having [condition]
16. Can you tell me whether attending CR had changed how you feel about your recovery and the future?
17. How important do you think it is for people to attend cardiac rehabilitation programs?
18. Have you gained much from attending CR? Prompt information, support, confidence, better understanding about lifestyle.
19. Can you tell me the changes you have made to your life since your heart attack (relevant condition)  
   Prompt, do you feel confident about making these changes, what support do you think would be useful to make these changes  
   Do you think you could have made these changes without going to CR?
20. Can you tell me if you think attending CR has helped your emotional recovery?  
   Prompt, has your mood changed?  
   Prompt, if so what would you put this down to?

Dropped out of CR
21. I can see from your questionnaire that you didn’t complete CR; can I ask you the reasons why you didn’t complete CR?  
   Prompt, would you like to return at a later date?
22. Was CR different from what you expected it to be, if so how it was different?
23. Can you tell me/remember how you felt about attending CR?
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24. Can you tell me/remember how you felt when you stopped attending CR?
25. Did CR have an effect on how you felt?
26. Did your mood change while you were attending CR?
   \textit{Prompt, has you mood changed since you have stopped CR, if so what would you put this down to, do you think you mood influenced your decision not to attend?}
27. Can you tell me the changes you have made to your life since your heart attack (relevant condition)
   \textit{Prompt, do you feel confident about making these changes, what support do you think would be useful to make these changes}

\textit{Didn’t attend CR}

28. In your questionnaire you mention that you didn’t attend CR, can I ask you the reasons why you didn’t attend?
   \textit{Prompt, what services/support would you have liked to be offered?}
29. Can you tell me how you feel about not attending CR?
30. Have you had any other support for your recovery from your heart attack (relevant condition)?
   \textit{Prompt, from information, support groups, family, GP other health services.}
31. Can you tell me the changes you have made to your life since your heart attack (relevant condition)
   \textit{Prompt, do you feel confident about making these changes, what support do you think would be useful to make these changes.}
32. How is that making you feel?
33. Since having your heart attack (relevant condition) has your mood changed?
   \textit{Prompt, if so what would you put this down to?}

\textit{Everyone}

34. Do you think you have received enough information about lifestyle, diet and changes you may need to make since you had your heart attack?
   \textit{Prompt, how easy is it to understand, what do you think is the most important information for you and your situation?}
35. Do you feel like you now have more control over your health and lifestyle now?
   \textit{Prompt, if no what could you do to have more control, how confident do you feel to maintain these changes?}
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36. Can you tell me if anyone has discussed with you or you have received much information about your psychological well being since your heart attack? Prompt, was it relevant, was it enough, do you think there should be more What other help or support do you think would be helpful for you? How relevant do you feel it would be to be able to talk to someone about your psychological well being?

37. If returned to work (from questionnaire), did you feel ready to return to work?

38. How has it been for you returning to work? Prompt, are your employers supportive, how are you finding it?

39. Is there anything else about your experience you would like to talk about?

40. What sort of things are you doing to help your heart health? Prompt, how are you finding doing/making these changes, do you feel confident to do them, how is this making you feel. What do you think has helped you make those changes? How motivated are you to make these changes?

41. Do you feel you have had enough support to make these changes? Prompt, from family, work, health services Can I ask you up to you had your heart attack what was your health like? Had you had any illnesses or injuries? How did you find your recovery from them?

Closing statement

Thank you for taking the time to share your experiences with us.