The Effect of Heart Focused Anxiety on Attentional Bias in Cardiac and Non-Cardiac Patients

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I certify that this thesis contains no material which has been accepted for the award of any other degree or diploma in any tertiary institution, and to the best of my knowledge and belief, contains no material previously published or written by another person except when due reference is made in the text of the thesis.

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Abstract

Many patients in health settings, either with or without a medically verified cardiovascular disease (CVD) experience a specific Heart Focused Anxiety (HFA), characterised by cardiorespiratory pain, psychological distress and a belief that the heart is faulty. In accordance with general models of anxiety and Eifert's (1992) HFA model, this study aimed to examine whether HFA participants with or without CVD displayed a content-specific attentional bias towards threatening cardiac stimuli and to clarify if a number of commonly cited factors know to influence bias patterns are also active in HFA. One hundred and seventy-eight participants were allocated to five experimental groups (NoCVD-HighHFA, NoCVD-LowHFA, CVD-HighHFA, CVD-LowHFA and NoCVD-LowHFA-High Trait Anxiety). The groups completed a visual-probe task at two presentation levels, subliminal (<100ms) and supraliminal (1000ms), and responded to seven types of stimulus words (Heart-High Threat, Heart-Moderate Threat, Heart-High Positive, Social-High Threat, Social-High Positive, Disaster-High Threat and Neutral). Overall, the results support the presence of a content-specific attentional bias towards threatening cardiac material relative to other word types in high HFA individuals with or without CVD at both levels of processing. A similar bias pattern was documented in CVD participants with low HFA. This can be contrasted with the healthy control (NoCVD-LowHFA) and the Hight Trait Anxious (NoCVD-LowHFA-HTA) groups who did not display this pattern. Unexpectedly, a bias towards positive information consistent with a protective attentional strategy to manage negative affect previously documented in the elderly was also displayed. The study's results provide evidence to support the HFA model (Eifert et al., 2000b) and the application of a Cognitive Behavioural approach in the treatment of HFA.

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Contents

A Summary of Frequently Used Abbreviations

Biased Attention Directional Account .... BADA

Cardiovascular Disease .... CVD

Chronic Obstructive Pulmonary Disease .... COPD

Cognitive Motivational View .... CMV

CVD and High HFA .... CVD-HighHFA

CVD and Low HFA .... CVD-LowHFA

Heart Focused Anxiety .... HFA

High Trait Anxiety .... HTA

Low Trait Anxiety .... LTA

Myocardial Infarction .... MI

No CVD and High HFA .... NCVD-HighHFA

No CVD and Low HFA .... NoCVD-LowHFA

No CVD and Low HFA and High Trait Anxiety .... NoCVD-LowHFA-HTA

Non-Organic Chest Pain .... NOCP

Post Traumatic Stress Disorder .... PTSD

Chapter 1

Introduction to the Study

Empirical literature indicates that anxiety conditions and cardiovascular disease (CVD) are common and often co-occur in Western countries (Carter et al., 1992; Eifert, 1992; Eifert, Zvolensky, & Lejuez, 2000b; Lane, Carroll, Ring, Beevers, & Lipp, 2002). Elevated anxiety has been identified as a potential risk factor in the aetiology of CVD (Shen, 2008; Suls & Bunde, 2005) and as a significant negative mediating factor in the effective prevention, early intervention and treatment of CVD (Donker, 2000; Frasure-Smith & Lesperance, 2008; Gallo & Mathews, 2003; Rugulies, 2002). This is due both to the proposed direct effects of stress and anxiety on the disease process of CVD (Krantz & McCeney, 2002; Roy-Byrne et al., 2008) and to the indirect negative effect that elevated anxiety commonly has on illness representations and information processing, which has been linked to the performance of negative health behaviours (Eifert et al., 2000b; Leventhal et al., 1997; Mayou et al., 2000).

Also related to elevated anxiety in cardiac settings is the high prevalence of individuals reporting with cardiorespiratory symptoms, such as chest pain, which is of a non-organic origin (Fleet et al., 1996; Zvolensky, Feldner, Eifert, Vujanovic, & Solomon, 2008). Non-organic chest pain (NOCP) is defined as chest pain in the absence of a cardiovascular disease or other likely medical explanation and is commonly related to elevated anxiety (Barsky, 2001) and often a specific fear of the heart and its functioning (Eifert et al., 2000b). This group is relevant because elevated anxiety in NOCP patients is linked with poor functionality and psychosocial outcomes (Eifert, Hodson, Tracey, Serville, & Gunawaredane, 1996; Potts & Bass, 1995). Indeed, NOCP patients experience similar levels of distress and disability to CVD patients and exhibit an increased and unwarranted use of medical resources (Barsky, 2001; Bass, 1990; Eifert et al., 2000b; Zvolensky et al., 2008).

These two patient groups are theorised to share a common anxiety condition. Empirical findings reveal that many of these patients, both with and without CVD, experience a heightened anxiety specific to the heart's functioning, which is theorised to be distinguishable from other anxiety disorders (Eifert et al., 2000b; Zvolensky et al., 2008) and has been labelled Heart Focused Anxiety (HFA). HFA is characterised by both cardiorespiratory pain and psychological distress in addition to the presence of a negative illness schema regarding the heart as faulty (Eifert et al., 2000b; Zvolensky et al., 2008). It is proposed that central to HFA's development and maintenance, and common to both patient populations is a specific cardiac-focused negative attentional bias (Aikens, Michael, Levin & Lowry, 1999b; Eifert et al., 2000b; Zvolensky et al., 2008).

In support of the principal role negative attentional bias plays in HFA aetiology, well-established cognitive theories of anxiety propose that negative attentional biases are pivotal in the development and maintenance of all problematic levels of anxiety and clinical anxiety disorders (e.g., Eysenck, 1997; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002; Mathews & MacLeod, 1994; Williams, Watts, Macleod, & Mathews, 1997). A robust body of research supports the key role of attentional bias in anxiety conditions and indicates that anxious individuals are more likely to detect and process potential sources of danger in their internal or external environment. That in turn increases anxious mood, reinforcing negative illness schemas and further increasing the individuals' level of vigilance towards threat, creating a negative attentional bias which is self-perpetuating (Mathews, 1990; Mathews & MacLeod, 2002). Negative attentional biases have been well documented in a wide range of clinical anxiety conditions (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Ijzendoorn, 2007). Of particular relevance to this study are results indicating the presence of negative attentional bias in individuals with Health Anxiety (e.g., Lim & Kim, 2005; Owens, Asmundson, Hadjistavropoulos, & Owens, 2004) and physical health conditions (e.g., Asmundson & Hadjistavropoulos, 2007; Fortune et al., 2003). Additionally, negative attentional biases have been detected in individuals with high trait anxiety (HTA) that do not meet the full criteria for a specific clinical anxiety disorder (e.g., MacLeod & Rutherford, 1992).

The application of cognitive theories of attentional bias to elevated HFA patients either with or without CVD suggests that an attentional bias towards heart sensation and information may serve to maintain the anxiety state. This is because elevated HFA will increase the probability that an individual, regardless of their cardiovascular health status, will detect any potential source of danger related to their heart and will interpret it in a threatening manner, thus intensifying the anxiety experienced (Eifert et al., 2000b; Ratcliffe et al., 2006; Zvolensky et al., 2008). Empirical literature indicates that the presence of a specific HFA in CVD patients is highly predictive of poorer physical and psychosocial outcomes (Donker, 2000, Frasure-Smith & Lesperance, 2008) and it is also a significant problem in individuals with NOCP who experience ongoing disability and distress (Bass, 1990, Barsky, 2001). However, the underlying cognitive processes mediating the documented link between poor outcome and anxiety in both CVD and NOCP patients are currently not well understood (Eifert et al., 2000b; Ratcliffe, MacLeod, & Sensky, 2006; Zvolensky et al., 2008). This is in part due to a lack of laboratory studies that directly examine attentional processes that are fundamental in the aetiological models of HFA (Eifert et al., 2000b; Ratcliffe et al., 2006). To the author's knowledge negative attentional bias in HFA has not yet been empirically investigated in a laboratory setting, so the present study was designed specifically to examine cardiac-focused negative attentional bias through the employment of a visual-probe task (MacLeod, Mathews, & Tata, 1986) which is a well-established and direct measure of attentional bias (Bar-Haim et al., 2007). The study's results are intended to provide empirical evidence to support Eifert et al.'s (2000b) HFA model by contributing to the understanding of the underlying mechanisms that are theorised to contribute to the maintenance of elevated anxiety and the consequent poor biopsychosocial outcomes of CVD patients with HFA. The findings of this study may be useful in the development of effective CVD prevention, management and rehabilitation programs. Further, the results may clarify the role of anxiety in NOCP patients and aid in the early detection and treatment of this patient group. Thus any meaningful results obtained from the study are likely to have applied and clinical relevance to health practitioners working in this area.

The following literature review aims to integrate research and theoretical works from a wide range of fields including medicine, epidemiology, health psychology and cognitive psychology to examine HFA and attentional bias. In doing so, the review begins with a brief examination of the current research regarding the impact of CVD in Australian society and the influence psychological factors may have on the disease processes, establishing that research in this area is necessary and topical. Following this, the contribution of patient illness representation on health outcomes is discussed. The illness representations bi-directional relationship with elevated anxiety via attentional processes is introduced. Non-organic chest pain patients are then reviewed and the commonalty in the underlying cognitive processes in both the CVD and NOCP groups is highlighted through the examination of HFA. The key processes of interest to this study (illness representation and attentional bias) are next examined explicitly in relation to HFA through a review of the current theoretical and empirical literature regarding heart related anxiety. Finally, a detailed exploration of the current cognitive models of general anxiety and biased attentional processes is completed. This is done to facilitate the development of experimental hypotheses regarding attentional bias and the HFA population that are well grounded in current theory and empirical literature. The literature review concludes with a number of hypotheses regarding HFA and attentional bias that are addressed in the subsequent empirical component of this study.

Chapter 2

Cardiovascular Disease in Australian Society

A Medical Definition of CVD

The term CVD covers all diseases and conditions of the heart and blood vessels and is diagnosed when an individual experiences significant difficulty with the functioning of the cardiovascular system due to a blockage and/or restriction of blood flow into the coronary arteries (Fauci et al., 2007; The National Health & Medical Research Council [NHMRC], 2009). The development of CVD involves a sequence of biochemical, immune-inflammatory and haemodynamic processes which interact with CVD risk factors such as smoking, hypertension, sedentary lifestyle, poor diet and obesity, cholesterol, age and sex (Krantz & McCeney, 2002; Ross, 1999). These risk factors are believed to play independent and overlapping roles in the development and maintenance of CVD (Ross, 1999).

There are several forms of CVD, including fatal or non-fatal myocardial infarction (MI), or cardiac arrest. Each can be verified by medical testing and is considered a hard endpoint in the current literature (Suls & Bunde, 2005). In this chapter only research utilising hard endpoints to verify the diagnosis of a CVD will be discussed. This is because angina pectoris (chest pain) is very difficult to validate as medically mediated and it is often diagnostically difficult to rule-out non-cardiac causes (i.e., anxiety). Patients with Non-organic chest pain will be considered in a separate section of the review.

The Human and Economic Cost of CVD

The Australian Institute of Health and Welfare statistics (AIHWS, 2008) indicates that CVD is the leading cause of death and disability in Australia, with more than 50,000 Australians dying from CVD per year (Australian Heart Foundation, 2008). CVD was responsible for 34 and 39 percent of Australian male and female deaths respectively in 2007 (Vos & Begg, 2007). Presently, approximately 3.7 million Australians are affected by CVD and of those affected 1.4 million are chronically disabled (Australian Heart Foundation, 2008; The National Health and Medical Research Council, 2009). Statistics indicate that the prevalence of CVD has increased by 18.2 percent in the last decade and is predicted to increase further in the next one, primarily due to the growing aged population in Australia (Australian Heart Foundation, 2008). Research reveals that CVD is the most common health problem in the elderly and the prevalence of the disease increases progressively with age, from 5% at age 20 to 25% to 30% at ages greater than 75 years (Australian Heart Foundation, 2008).

Additionally, as medical interventions improve more CVD patients will survive and require costly clinical care and rehabilitation. The economic and psychosocial cost of heart disease is considerable, and in Australia the economic burden exceeds that of any other disease (Vos & Begg, 2007), costing $5.9 billion per year in terms of direct health-care expenditure (The National Health & Medical Research Council, 2009). This figure does not include indirect costs such as lost economic productivity, but research reveals that a large percentage of patients fail to return to work or normal functioning after a MI despite being physically well (Petrie, Cameron, Ellis, Buick, & Weinman, 2002; Petrie, Weinman, Sharpe, & Buckley, 1996; Shanfield, 1991). These costs are compounded by the negative impact that unhelpful illness behaviour can also have on the individual's quality of life, support systems and social functioning (Eifert et al., 2000b; Petrie et al., 2002; Zvolensky et al., 2008).

Therefore, the large number of people affected by CVD, in conjunction with improved survival rates and the increasing number of elderly in Australian society, demand continued improvements in understanding what influences the prognosis and maintenance of CVD. These improvements will theoretically contribute to the development of effective primary intervention, treatment and rehabilitation into the future. Together this provides justification for the selection of heart-related illness for further empirical study.

Psychosocial Factors in the Aetiology of CVD

Significant gains have been made in the treatment of CVD. While at present CVD is commonly treated through surgical and pharmacological means (Donker, 2000), in the last three decades the relationship between medical illness and psychosocial factors has received increased attention in both the biomedical and psychological fields (Krantz & McCeney, 2002). Extensive evidence from various areas (i.e., animal model and epidemiological studies and human clinical research) indicates that, in addition to the well-established biological and behavioural risk factors affecting the development and prognosis of CVD (e.g., smoking, high cholesterol, and obesity) psychosocial factors are also important (Bunker et al., 2003; Eifert et al., 2000b; Krantz & McCeney, 2002).

Recent research indicates that psychosocial variables have a significant effect on the development and prognosis of CVD and are important in the prevention and treatment of the disease (Donker, 2000, Frasure-Smith & Lesperance, 2008; Gallo & Mathews, 2003; Gomez-Caminero, Blumentals, Russo, Brown, & Castilla-Puentes, 2005). For example, empirical evidence indicates that psychological factors become more important than medical factors in influencing the recovery process after a MI (e.g., Petrie et al., 2002; Petrie et al, 1996). The most widely reported and validated psychosocial factors include; social isolation and poor social support, life-stress and job strain, socio-economic characteristics and negative affect (Krantz & McCeney, 2002).

Negative affect is comprised of anxiety, anger-hostility and depression and has been widely reported as a risk factor in the development and maintenance of CVD (i.e., Donker, 2000; Gallo & Mathews, 2003; Krantz & McCeney, 2002; Rugulies, 2002). Numerous studies have concluded that depression and anxiety are predictive of CVD morbidity and mortality, even after traditional risk factors are controlled (Donker, 2000, Frasure-Smith & Lesperance, 2008; Gallo & Mathews, 2003; Gomez-Caminero et al., 2005). However, anger, hostility and hostility expression are associated with more mixed findings (Kranz & McCeney, 2002). Suls and Bunde's (2005) review suggest that the general distress shared across depression, anger/hostility and anxiety is responsible for the link between these variables and CVD. However, additional analysis of that data and more recent research has found that anxiety is associated with increased risk of CVD and hard endpoints beyond the effects of general distress associated with negative affect (Kubzansky, Davidson, & Rozanski, 2005; Kubzansky, Cole, Kawachi, Vokonas, & Sparrow, 2006; Roy-Byrne, 2008; Shen, 2008). This suggests that the three traits should be examined independently. The current research focused on the influence of anxiety, and in particular examines the underlying cognitive processes specific to anxiety that have been hypothesised to contribute to the poor biopsychosocial outcomes recorded for CVD patients with elevated anxiety and was selected for examination due to a lack of empirical research in this area (Ratcliffe et al., 2006; Roy-Byrne et al., 2008).

In summary, CVD affects a large number of Australians and is likely to create increased management challenges for policy and health providers into the future, demanding further developments in the ability to effectively treat this condition. Anxiety-related cognitive processes are a factor that has been causally linked with poor biopsychosocial outcomes in CVD and has been chosen for further study. However, cardiorespiratory distress is linked with a range of physical symptoms, including chest tightening, heart palpitations, irregular heartbeat, choking and feelings of suffocation, sweating, pounding in the neck and numbness (Beck et al., 1990; Lum, 1987). The symptoms may be a result of either an organic disease or an anxiety response, or a combination of both, therefore patients with non-organic chest pain and elevated anxiety will also be considered in this study to explore whether the patterns of cognitive processing are unique to individuals with CVD or also found in individuals with NOCP. The following chapters examine the effect of anxiety in the CVD population followed by those with NOCP. It will be argued that although these two groups differ in organic health status, the cognitive processes particular to heightened anxiety contribute to the documented negative outcomes in both groups. Further it is argued that a specific type of anxiety focused on fears regarding the heart's health may be a key factor in understanding the mechanisms that contribute to the documented poor outcomes. To support this argument, the role that illness representations may play in the two populations will be examined. This will be achieved through a review of the evidence related to the effect that illness representations have on health outcomes as well as the significant role that high anxiety plays in shaping illness representations. The circular and self-perpetuating nature of this relationship will be highlighted.

Chapter 3

An Illness Representation Approach to Cardiovascular Presentations

The physical and psychological expression of illnesses such as CVD varies significantly from patient to patient, even when the organic pathology is similar (Leventhal et al., 1997). Consistent with the empirical research suggesting a link between anxiety and CVD outcomes, reliable findings regarding outcome variability suggest factors such as an individuals' personality, mental health status, personal history and cognitions may be crucial in understanding their illness course and health outcomes (Cameron, Petrie, Ellis, Buick, & Weinman, 2005; Cioffi, 1991; Cooper, Weinman, Hankins, Jackson, & Horne, 2007; Eifert & Forsyth, 1996; Leventhal et al., 1997; Mayou et al., 2000). This is because individuals are highly responsive to internal representations and subjective constructions of illness and symptoms (Cioffi, 1991; Leventhal et al., 1997). Idiosyncratic beliefs regarding illness and treatment have been found to have a major impact on illness severity and outcomes (Adler & Mathews, 1994; Leventhal et al., 1997). Indeed, perceived health status and internal representations of health and illness predict mortality independent of biological risk factors. Research indicates, that individuals who assess their health as poor are two to five times more likely to die within two to thirteen years compared to those who rate themselves as very healthy (Idler & Benyamini, 1997). This risk remains after controlling for a number of factors, including age and diagnosed medical condition. Logically contributing to poor outcome, empirical studies also demonstrate that patients with a negative illness representation typically display a decreased adherence to treatment regimes and as a consequence obtain poorer treatment outcomes (Horne, 1999).

More specific to diseases of the heart, research has found that CVD patient's beliefs and perceptions about their illness play a principal role in health outcome (e.g., Petrie et al., 2002; Trelawny-Ross & Russell, 1987; Weinman, Petrie, Sharpe, & Walker, 2000). Causal attributions made regarding a heart attack may influence recovery by enhancing the patient's perceptions of control and predictability, which is linked to the performance of positive illness behaviour (Weinman et al., 2000). Plotkin-Israel (1984) demonstrated that attributing one's heart attack to potentially controllable factors is related to greater adherence to medical advice during the first year of recovery, linked to improved outcome. In another study, patients who believed the consequences of their heart attack to be serious and long lasting had greater levels of illness-related disability at work, at home, in recreational activities and social interactions, and were slower to resume paid work than those who did not (Petrie et al., 1996). Further work by Petrie et al. (2002) suggests that positively modifying a first time MI patient's illness representations early in their hospital stay resulted in increased optimism about illness control and cure. This produced a faster return to work and a lower frequency of symptom reporting compared with a control group. Petrie et al. (2002) emphasise that in both studies illness representations were not connected to objective medical measurements of MI severity nor did severity significantly predict outcome, rather the outcome was predicted by the patients illness representation.

Leventhal's Self-Regulatory Model of Health and Illness

It is through a patient's idiosyncratic illness representations that health related behaviours, such as the interpretations of symptoms; coping responses and the use and evaluation of medical treatment are based (Cioffi, 1991; Leventhal et al., 1997). Research exploring patient illness representations is commonly understood through the application of Leventhal's Self-Regulatory model of health and illness (Leventhal et al., 1997). A large body of evidence reveals that in order for an individual to understand and cope with a potential or actual illness, a unique and idiosyncratic internal representation of the particular illness is created based on the patient's past experiences and the current and available internal and external environmental information (Cioffi, 1991; Leventhal & Crouch, 1997). Hence, the Self-Regulation model can be applied to the health behaviours of individuals who obtain a medical diagnosis of CVD, or individuals who simply believe that they have a heart condition, because it is the individual's belief regarding his or her health status that drives health behaviours, and subsequent cognitive and emotional responses.

Leventhal et al.'s (1997) model suggests that illness episodes trigger parallel processing of problem-focused and emotional-focused regulation. The problem-focused component involves the patient developing a cognitive model of the illness to allow for its practical management. This can be contrasted with the emotional-focused component, which simultaneously functions to identify emotional experiences and to select strategies to minimise negative emotional reactions.

Studies exploring the problem-focused component of patient models of illness have consistently identified five distinct but related dimensions into which beliefs about illnesses are organised (Sharloo & Kaptein, 1997). The first dimension consists of perceptions regarding the identity of the problem (label, signs and symptoms) that are reciprocally related and demonstrate the layered nature of illness representations, which are the abstract label (i.e., heart attack) and the concrete signs and symptoms (breathlessness, chest pain). The other dimensions are; probable cause(s) (environmental or genetic), possible consequences (short-term/long-term; in physical, social, economic and emotional terms), the expected time-line for duration and course (acute/chronic or cyclic/episodic) and the potential for cure or controllability of the illness (influence of self or medical professionals on the course of the illness). Each dimension is proposed to have a specific effect on coping behaviours and subsequent health outcomes and they may also interact with each other (Leventhal et al., 1997). When combined, an individual's judgment about the five dimensions generates a global belief about the illness which functions to motivate action and guides subsequent cognitive processing of stimuli related to the illness (Leventhal et al., 1997).

Leventhal et al. (1997) suggest that a patient's cognitive understanding of an illness is processed in parallel to an emotional response and emphasise the importance of understanding both the underlying cognitive and affective processes that are involved in the development of health related beliefs and behaviours. Research indicates that the parallel processes can operate independently, allowing for the ability to direct behaviour towards realistic problem solving or can be mutually interfering (Smith, Kelly, Lazarus, & Pope, 1993). If these parallel representations conflict, then the resulting behaviour is determined by the relative salience of each (Cameron, 1997). In essence the Self-Regulation model aims to account for how individuals organise and process health information on both a cognitive and emotional level and highlights the complex interaction of the two representations in illness related behaviour.

Information regarding a CVD or NOCP patient's cognitive and emotional illness representation of CVD is useful in considering how best to influence a patient's appraisal of an existing or potential health threat and therefore modify their behaviour and improve health outcomes. For example, when faced with threatening objective personal health information, a strictly cognitive approach would lead to an increase in perceived vulnerability and consequent behaviour to address the vulnerability. However, research suggests that once a certain level of distress has been reached it may paradoxically motivate an avoidant response rather than the adaptive behavioural response expected (Cameron, 1997; Croyle, Sun, & Hart, 1997). Additionally, and central to the current thesis, research indicates that high levels of distress can also increase the patient's perceptual search for internal and external threat-related information creating a negative attentional bias in processing (Weinman & Petrie, 1997). This may provide the mechanisms for the development and maintenance of unrealistically negative (problem-focused) illness representations. This is because attentional bias facilitates the gathering of further evidence to support the existing negative illness representation, leading to its elaboration and reinforcement (Cioffi, 1991; Henderson, Hagger, & Orbell, 2007; Lecci & Cohen, 2002). As a consequence emotion-focused processing may increase, which then dominates attention and coping efforts compromising or disrupting problem-focused efforts (Eyesnck, 1997; Smith et al., 1993). This may foster the consequent unhelpful illness behaviours discussed earlier.

Indeed, reflecting the operation of a self-perpetuating cycle of anxious responding and unhelpful behaviours, a body of empirical research indicates that the influence of illness representations on cognitive processing is significant and shapes what an individual attends to, understands, encodes and remembers (Leventhal et al., 1997). Further, this effect has been reported in research specific to heart-related illness representations (e.g., Henderson et al., 2007; Martin & Lemos, 2002). Hence, illness representations not only serve to determine the selection of illness-related behaviour and emotional reactions but also function as a conceptual framework for making sense of incoming input, provided by the external (e.g., health care professionals) and internal (e.g., increased heart rate) environments (Petrie et al., 2002). Based on this research it is proposed that the relationship between anxiety-related attentional bias and illness representations is best conceptualised as circular and self-perpetuating.

In summary, the application of the illness representation approach to CVD and NOCP has emphasised the important role idiosyncratic beliefs about a potential heart condition play through its effect on attentional processes and the subsequent reinforcement of negative emotional and cognitive illness representations regarding the heart. However, despite considerable empirical evidence to support the theoretical validity of the illness perception approach in heart-related presentations (e.g., Petrie et al., 1996; Weinman et al., 2000), less empirical work has been completed on the mechanisms that influence the development and maintenance of the cognitive and affective representations of illness (Weinman & Petrie, 1997; Williams, Wasserman, & Lotto, 2003). The current study proposes that heightened anxiety and particularly the accompanying negative attentional bias is one such factor that affects the development and maintenance of unhelpful illness representations in both CVD and NOCP patients and plays a key role in creating the self-perpetuating cycle of unhealthy cognitive, emotional and behavioural responding outlined in the introduction of this thesis.

To further explore the influence of anxiety on CVD, the next chapter will review the prevalence of elevated anxiety in CVD patients and their distinctive health outcomes. An examination of the current literature addressing the link between elevated anxiety and the development and maintenance of CVD will also be completed to emphasise the importance of understanding the underlying workings of this link.

Chapter 4

Anxiety and Cardiovascular Disease

A considerable number of patients accessing medical services for heart-related concerns experience elevated anxiety and many meet the criteria for a clinical anxiety disorder (Fleet et al., 2005; Ratcliffe et al., 2006; Zvolensky et al., 2008). Although the definition of anxiety has been widely debated in the literature (see Barlow, 2000 for a review), anxiety is generally accepted to be an aversive emotional state resulting from feelings of being unable to predict or control outcomes related to possible future threat, danger or fear (Barlow, 2000), or more simply, anxiety is an emotive response to a perceived threat (De Jong & Hall, 2006). This definition will be applied in the current research. Further, anxiety encompasses two related but separate constructs: state and trait anxiety, both were considered in the current project. State anxiety is seen as a current and transitionary emotional state and is "characterised by subjective feelings of tension, apprehension, nervousness, and worry, and by activation or arousal of the autonomic nervous system" (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983, p. 4). This can be contrasted with trait anxiety, which is seen as a reasonably stable and enduring personality characteristic, related to the tendency to interpret situations as unduly dangerous and threatening, resulting in elevated state anxiety and a higher frequency of time spent in this state (Spielberger et al., 1983). Finally a clinical anxiety disorder is diagnosed when the emotional condition of the individual negatively affects that individual's ability to function in a variety of areas of life over a defined period of time and meets specific criteria stipulated in the

Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, 2000). These definitions were adopted throughout this study.

Research indicates that the prevalence of clinical anxiety disorders in cardiology patients is between 25 percent and 35 percent (Carter et al., 1992; Fleet & Beitman, 1998; Fleet et al., 2005; Trelawny-Ross & Russell, 1987) in comparison with 6.4 percent to 13.3 percent in the general population (ESEMeD/MHEDEA, 2004; Kessler, Chiu, Demler, & Walters, 2005). In addition, there are many CVD patients who do not meet the full diagnostic criteria for a DSM-IV-TR (2000) anxiety disorder, but present with a collection of anxiety-related symptoms, and experience significant impairment (Zvolensky et al., 2008). Although anxiety is a common and understandable reaction to a heart-related health event (Lane et al., 2002), research suggests that a significant percentage of CVD patients continue to experience persistent and unrelenting anxiety following the initial episode. For example, one study reported that in post-MI patients, approximately 40 percent were anxious at four months and then at one year following the initial medical event (Lane, Carroll, Ring, Beevers & Lip, 2001).

Female cardiac patients appear to be at greater risk of anxiety than men following a coronary event (Frasure-Smith, 1991). For example, in a study comparing anxiety in women and men facing coronary artery bypass graft surgery, women had a higher level of trait and state anxiety throughout both the preoperative and postoperative stages (McCrone, Lenz, Tarzian, & Perkins, 2001). However, a limitation of this research is that it relies heavily on self-report assessment of anxiety, which due to response bias may not provide an accurate picture of the actual anxiety experienced

(Moss-Morris & Petrie, 2003). This bias is further compounded by a documented difference in the extent of emotionality that the two sexes are prepared to self-report (Lewis, Haviland-Jones, & Feldman Barrett, 2008). This is pertinent to the current study, which addresses the potential confounding effects of self-report measurements through the adoption of methodology that does not rely solely on participant self-report to provide information about anxiety-related processing. Additionally, participant sex was considered as a covariate in the following empirical study to control for any potential sex effects.

Age also seems to affect the anxiety levels reported by CVD patients. For example McCrone et al. (2001) compared the reported anxiety levels of different age groups while recovering from cardiac surgery and found that for both sexes a younger age was a stronger predictor than sex for increased anxiety. Research on aging suggests that older people are more accustomed to changes in their health status because of the general aging process, and have typically developed techniques to cope with compromised health (Leventhal & Crouch, 1997). For example a coping strategy commonly utilised in elderly populations is the unconscious repression of negative information, (Erskine, Kvavilashvili, Conway, & Myers, 2007) and increased attention to positive information (Mather & Carstensen, 2003) reducing the experience of negative affect. Based on these findings it is recommended that participant age is also considered and/or controlled for in studies examining anxiety, cognitive processing and health outcomes, to ensure that differences in reported anxiety or cognitive processing are not an artefact of age. Age was controlled in the following empirical study.

In summary, it appears that anxiety conditions occur at a high rate in people with heart-related illness or heart related illness concerns and may also be influenced by factors such as age and sex. Unfortunately, anxiety is commonly overlooked in cardiology and emergency rooms (Eifert et al, 2000, Fleet et al., 1998). This may be particularly problematic because research suggests that the physiological expression and the cognitive and behavioural outcomes of high anxiety contribute significantly in the genesis, maintenance and prognosis of cardiac conditions (Donker, 2000, Frasure-Smith & Lesperance, 2008; Gallo & Mathews, 2003; Gomez-Caminero et al., 2005; Kubzanskt et al., 2005, 2006; Roy-Byrne, 2008; Shen, 2008). This link remains even after controlling for established cardiovascular disease risk factors such as cholesterol levels, blood pressure and smoking (Gallo & Mathews, 2003). A brief review of the evidence for the role of anxiety in the development and maintenance of CVD now follows.

Anxiety and the Onset and Progression of CVD

There is robust epidemiological evidence demonstrating that elevated anxiety is a risk factor predisposing one to the development of CVD and increases the risk of ischemic or arrhythmic events and sudden cardiac death (Gomez-Caminero et al., 2005; Smoller et al., 2007; Suls & Bunde, 2005). This research also provides evidence to support the notion that anxiety is an independent contributor to the onset of heart-related medical problems such as MI (Jakobsen, Foldager, Parker, & Munk-Jorgensen, 2008; Roy-Byrne et al., 2008; Shen, 2008). However, despite an increasing body of literature supporting the link between anxiety and the development of CVD, it is not entirely conclusive (Bunker, et al., 2003; Krantz & McCeney, 2002; Suls & Bunde, 2005). This uncertainty is proposed to be primarily due to current methodological limitations in the literature (see Bunker et al., 2003 for a review).

Perhaps more central to the current study, is the role of elevated anxiety in the maintenance of the disease process and the reported poorer outcomes for this subgroup of CVD patients. This is because this link highlights the need to understand what underlying cognitive processes drive the self-perpetuating cycle of anxious responding, unhelpful health cognitions and the performance of unhelpful behaviours as discussed in chapter three. Prolonged and/or high levels of anxiety have been linked to poor health outcomes and to the progression of CVD independent of other psychological disorders such as depression (Fleet & Beitman, 1998; Frasure-Smith & Lesperance, 1998; Frasure-Smith & Lesperance, 2003; Frasure-Smith, Lesperance & Talajic, 1995). For example, Huffman, Smith, Blais, Januzzi and Fricchione (2008) examined post-MI patients and found that anxiety independent of depression, demographic and medical variables was an independent risk factor for serious in hospital complications. Further, at a two-year follow-up Frasure-Smith and Lesperance (2008) found that anxiety independently predicted an increased prevalence of cardiac death, survived MI's, survived cardiac arrests and non-elective revascularization in 804 stable coronary artery disease patients.

Empirical research by Mayou et al. (2000) indicates that responding to cardiac related events with anxiety contributes to greater levels of perceived pain (i.e., chest pain), disability in daily functioning and the performance of cardio-protective behaviours, and future episodes of elevated anxiety regardless of the medical severity of the illness. They also found anxiety increased the use of primary care resources and was associated with reduced secondary lifestyle changes, such as exercise, diet modification and smoking. Finally, anxiety has been associated with lowered quality of life in emotional, physical and social domains (Mayou et al., 2000) and delayed return to paid employment (Mayou et al., 2000; Petrie et al., 1996).

Of relevance to the current research project, is the particularly strong link between CVD and Panic Disorder (Roy-Byrne et al., 2008). This is important because a key symptom of Panic Disorder is cardiorespiratory discomfort, in addition to a tendency to interpret these symptoms as unrealistically threatening (Clark, 1989; Ehlers & Bruer, 1992). Indeed, research suggests that a patient's psychological response to a heart condition may continue to have a strong influence on their physical and emotional functioning long after the initial damage to the cardiovascular system has been resolved. For example it was found that return to work, exercise, leisure and sexual activity were all strongly influenced by somatic symptoms of chest pain, breathlessness and tiredness independent of illness severity in a group of post-MI males on four occasions over a six month period (Trelawny-Ross & Russell, 1987). Based on such findings it was hypothesised that heart-related anxiety and the associated negative illness representations may function to influence the patient's emotional, cognitive, physiological and behavioural response to CVD, thus creating vulnerability to CVD risk factors via direct physiological and indirect behavioural pathways.

While it is acknowledged that the findings regarding the link between anxiety and the progression of heart disease are not conclusive (e.g., Grace et al., 2004; Lane et al., 2001; Mayou et al., 2000; Suls & Bunde, 2005) it is agued by a number of authors (Bunker et al., 2003; Frazure-Smith & Lesperance, 2008; Krantz & McCeney et al., 2002; Suls & Bunde, 2005) that the inconclusive nature of the literature reflects methodological limitations. For example, the use of prospective studies that rely on existing data sets (See Scheier & Bridges, 1995) and inconsistency in the definitions of anxiety used between studies (for a review see Suls & Bunde, 2005; Roy-Byrne et al., 2008). However, cumulatively the evidence for the independent role of anxiety in the development and progression of CVD remains convincing.

Anxiety and Pathways to CVD

The mechanisms underpinning anxiety's effect on CVD aetiology may include a direct biological pathway (Kamarck & Jennings, 1999; Krantz & McCeney, 2002; Ronzanski & Kubzansky, 2005; Roy-Byrne et al., 2008; Wittstein, et al., 2005) and a variety of more indirect pathways that can result in detrimental health behaviour and consequent compromised health (Ratcliffe et al., 2006). Both pathways involve a complex interaction between anxiety, cognitions, behaviour and the body's biology and physiology which exacerbates the processes that lead to the development of CVD (Barsky, 2001; Frasure-Smith & Lesperance, 2008; Ratcliffe et al., 2006; Schwartz, Trask, & Ketterer, 1999).

The review now turns its focus exclusively to the indirect pathways, and examines the role of anxiety based attentional bias in information processing (though of course other factors and both pathways interact). This area has been selected because anxiety conditions have been linked to the preferential processing of threat information (Bar-

Haim et al., 2007; Mathews & MacLeod, 2002). It is suggested that this process may contribute to the development of overly negative illness representations (Weinman & Petrie, 1997) as discussed in the previous chapter and that this will then contribute to the performance of unhelpful health behaviours documented in CVD patients reporting elevated anxiety (Fleet & Beitman, 1998; Kessler et al., 2006; McCabe et al., 2004; Smith & Gallo, 2001; Zvolensky et al., 2008), which are linked to the development and maintenance of CVD (Krantz & McCeney, 2002; Ross, 1999). Similar unhelpful illness behaviour has also been reported in individuals presenting with elevated anxiety and NOCP (Aikens et al., 2001; Bass, 1990; Barsky, 2001; Eifert et al., 2000b;). The next chapter reviews this population and explores the common psychopathology that both groups are theorised to share in order to further understand the effect that anxiety-based attentional biases may have on the cognitions, emotions and behaviours of people unduly anxious about their hearts health.

Chapter 5

Cardiorespiratory Distress, Non-organic Chest Pain and Heart Focused Anxiety

Non-Organic Chest Pain (NOCP) and Cardiorespiratory Distress

In addition to individuals experiencing cardiorespiratory distress due to organic illness, there is a high prevalence of individuals reporting to medical facilities with chest pain and other cardiorespiratory symptoms, which are non-organic in origin (Beitman et al., 1989; Fleet et al., 1996; Zvolensky et al., 2008), of this group there are a significant number who experience recurrent episodes of NOCP (Aikens et al., 2001; Barsky, 2001; Channer, James, Papouchado, & Rees, 1987; Eifert et al., 2000b; Zvolensky et al., 2008). The recurrent NOCP population is of particular interest in this study, not only because of the poor psychosocial and practical functioning associated with this group (e.g., Eifert et al., 1996; Potts & Bass, 1995), but because studying the underlying mechanisms related to anxiety (attentional bias) in this group – a group unduly anxious about the functioning of their hearts may provide useful information about the underlying cognitive mechanisms in CVD patients who are also highly anxious about their hearts. Consistent with this proposal, current models of HFA (e.g., Eifert et al., 2000b, Ratcliffe et al., 2006) hypothesise that the underlying mechanism of biased information processing that contribute to the perpetuation of elevated anxiety regarding the heart and the resultant negative health behaviours are common to both groups. Empirical validation of this would provide support for the theoretical model of HFA and thus aid in the development of more effective primary and secondary intervention, in addition to informing ongoing research. The NOCP group will now be discussed.

NOCP is a considerable problem; research suggests that 20 to 35 percent of patients presenting to emergency rooms reporting cardiorespiratory distress are eventually found to have no measurable organic pathology (Gibler et al., 1995). In a study of primary care patients presenting with chest pain, a definite medical cause could be established for only five of the 80 patients following a full diagnostic assessment (Kroenke & Mangelsdorff, 1989). In another study, 43 percent of patients undergoing coronary angiograms displayed no clinical evidence of CVD (Carmin, Wiegartz, Hoff, & Kondos, 2003). Unfortunately research indicates that few NOCP patients are offered treatment regarding their heart related concern and worry beyond feedback that they do not have CVD (Barsky, 2001; Eifert et al., 2000b; Eifert et al., 1996; Zvolensky et al., 2008).

Although many NOCP patients are satisfied with a negative medical result, there is a significant portion of this population who continue to ruminate and experience elevated anxiety regarding their heart's health and remain in the medical system despite reassurance and extensive clinical testing (Channer et al., 1987; Bass, 1991; Barsky, 2001). Approximately 65 percent of NOCP patients continue to experience chest pain and related disability until a correct diagnosis of NOCP is made and appropriate psychiatric treatment is provided (Bass, Wade, Hand, & Jackson, 1983). Consequently this group remain active in the medical system and incur a significant cost in terms of time and money, related to repeat visits to medical facilities and extensive and unnecessary laboratory testing (Aikens et al., 2001; Eifert et al., 2000b; Zvolensky et al., 2008).

Theoretical models and empirical literature suggest that the basis of recurrent NOCP in a significant number of patients is related to elevated anxiety regarding the heart's health (Barsky, 2001; Eifert, 1992). Studies of NOCP patients indicate that at least 25 percent experience limited symptom panic attacks or meet full criteria for Panic Disorder (Beck, Berisford, Taegmeyer, & Bennett, 1990; Beitman et al., 1987b; Fleet & Beitman, 1998). This suggests that a significant number of NOCP patients suffer with panic related anxiety, which has been theoretically and experimentally linked to the development of heart-related fear and anxiety (e.g., Clark, 1986; Ehlers & Bruer, 1992).

The presence of anxiety in NOCP patients has been associated with significant psychosocial and functional disability. For example, one prospective study revealed that eleven years after a negative angiogram, baseline anxiety and depression were predictive of continued chest pain and functional limitations in NOCP patients (Potts & Bass, 1995). Indeed, patients with chronic NOCP typically report elevated levels of cardiac-related distress, (physical pain and psychological anxiety) (Carmin et al., 2003) and experience similar or more disability than CVD patients (Bass, 1990; Barsky, 2001). Additionally, NOCP is associated with increased disease fear and conviction, persistence of help seeking and reassurance seeking behaviour, cardio-protective behaviours (e.g., avoidance), and increased likelihood of future episodes of elevated anxiety (Eifert et al., 1996; Eifert et al., 2000b; Zvolensky, Eifert, Feldner, & Leen-Feldner, 2003).

Illustrative of this behaviour in NOCP patients, a combined Australian and US study found that recurrent NOCP patients experience the same level of fear regarding pain and autonomic sensations (chest pain and palpitations) as patients with coronary artery disease, and display higher levels of cardiac disease conviction, cardiac sensation awareness and behaviours designed to protect their heart than non-cardiac surgical patients and healthy controls, but not the coronary patients. Finally, healthy heart-anxious (NOCP) participants reported more panic and other anxiety symptoms, hypochondriacal beliefs, physical symptoms, obsessive-compulsive concerns, and negative affect when compared to all other groups in the study (Eifert et al., 1996).

Several psychological factors generally tend to differentiate NOCP patients from those patients with CVD and low levels of anxiety. The former group is younger, more likely to be female (Carmin et al., 2003), have a higher prevalence of diagnosable psychiatric conditions (Aikens et al., 1999a; Barsky, 2001) and report historical exposure to cardiac related incidents (Aikens et al., 1999a; Eifert, 1992; Eifert & Forsyth, 1996). Central to the current research study, NOCP patients also report an increased hypersensitivity to perceiving cardiac-related stimuli and a strong disease conviction. This is coupled with high levels of catastrophic thinking and emotional distress focused on cardiac cues (Eifert, et al., 2000b).

It is less clear from the current literature on what psychological factors patients with high heart-related anxiety and a diagnosed cardiovascular disease differ from patients with recurrent NOCP and high-heart anxiety. However the literature clearly demonstrates some significant similarities between the two groups, in the presence of unrealistically negative illness representations regarding the heart (Aikens et al., 2001; Eifert et al., 1996; Ratcliffe et al., 2006) and consequent unhelpful illness behaviour

(Aikens et al., 1999a; Aikens et al., 1999b; Frasure-Smith & Lesperance, 1998; Mayou et al., 2000). This logically indicates the need for further research in this area to explore these similarities. Consequently this project aimed to determine if the processing of heart-relevant stimuli reveals a uniform negative attentional bias in both groups. These findings would be of particular theoretical and clinical relevance because biases in processing have been linked to elevated health anxiety (e.g., Owens et al., 2004) and a perpetuation of negative affect, cognitions and behaviour (Mathews, 1990; Jopson & Moss-Morris, 2003; Williams et al., 1997). The findings would contribute to the validation of theoretical models of HFA (i.e., Eifert et al., 2000b; Rafcliffe et al., 2006) and its practical application may contribute to the development of improved assessment and treatment regimes for CVD and NOCP patients with elevated heart-related anxiety.

In conclusion, it would appear that patients with recurrent NOCP experience an elevated level of anxiety specific to the functioning of the heart, very similar to many patients with an organic heart condition. This specific type of anxiety has been labelled Heart Focused Anxiety (Eifert, 1992; Eifert, 1996; Eifert et al., 2000b) and has been found to be present in both individuals with CVD and those with recurrent NOCP (Fleet & Beitman, 1998; Zvolensky et al., 2008). HFA is a central concept to this thesis and it is proposed that it commonly underlies the anxiety observed in cardiac and medical setting discussed thus far.

Heart Focused Anxiety

The fear of the heart and its functioning is well documented in empirical and theoretical literature both in the medical and psychological fields (e.g., Barsky, 2001;

Conti et al., 1989; Eifert, 1992; Eifert et al, 2000b; Fleet & Beitman, 1998; Fleet et al., 2005). It is commonly referred to as Cardiophobia (e.g., Zvolensky et al., 2008), or Heart Focused Anxiety (Eifert, 1992; Eifert et al., 2000b). HFA occurs in both emotional and physical disorders (Barsky, 2001; Eifert, 1992; Eifert et al., 2000b; Zvolensky et al., 2008) and is relevant to a number of medical and psychological conditions characterised by cardiorespiratory discomfort and affective distress, such as CVD, NOCP and Panic Disorder (Barsky, 2001; Eifert et al., 2000b; Ratcliffe et al., 2006). A study of HFA prevalence suggests that HFA affects about two to three percent of the population and is slightly more likely to occur in females than males (Eifert & Forsyth, 1996).

HFA is defined as a chronic, abnormal, and unrealistic fear of the heart, despite reassurance that there is no medical threat (Eifert et al., 2000b). More specifically, HFA is characterised by an unfounded concern regarding cardiorespiratory sensations, persistent monitoring of the heart, continued suspicion of disease presence despite negative medical results and reassurance, in addition to repeated reassurance seeking and excessive use of medical facilities, coupled with the avoidance of activities believed to elicit cardiorespiratory symptoms (Barsky, 2001; Eifert, 1992; Eifert et al., 1996; Eifert et al., 2000b; Zvolensky et al., 2008).

To measure HFA and facilitate further research, Eifert et al., (2000a) developed the Cardiac Anxiety Questionnaire (CAQ). This is a self-report measure that examines patient interpretations of cardiac symptoms and sensations as well as related behaviours. Eifert et al. (2000a) initial analysis of 188 individuals, indicated that CAQ items could be understood as reflecting three factors, fear about heart sensation, avoidance of activities that may cause the sensations and heart-focused attention. More recently Marker, Carmn and Ownby (2008) examined the data of 658 individuals who were about to undergo an electron beam tomographic screening to determine whether they had clinically significant coronary atherosclerosis. They reported similar findings, but reported that four factors provided the best fit for the results, these were heart-focused attention, avoidance of activities that bring on symptoms, worry or fear regarding symptoms and reassurance seeking. These researchers attributed the difference in the findings to be related to sample size. Significantly, the four-factor structure was similar in individuals with and without clear evidence of coronary atherosclerosis, suggesting that the four factors are relevant to and shared in individuals with or without a diagnosed CVD.

HFA a Discrete Clinical Condition

Panic Disorder and HFA are aetiologically related (e.g., Clark, 1986; Ehlers & Bruer, 1992; Fleet et al., 2005) and perhaps as a consequence, cardiology and emergency room settings show an over-representation of patients with panic symptoms, the prevalence of Panic Disorder has been reported to be as high as 60 percent in cardiology settings (DSM-IV-TR, 2000) and 18 (Yingling, Wulsin, & Amold, 1993) to 50 percent (Carter, Servan-Schreiber & Perlstein, 1997) in emergency room settings. This is significantly higher than the prevalence of PD in the general population (1% to 3.5%) or primary care medical populations (7%) (DSM-IV-TR, 2005; Fleet et al., 1996).

The high presence of Panic Disorder in these settings has been found in individuals both with and without a diagnosed CVD. For example, in a study that examined the presence of Panic Disorder in 250 consecutive walk-in patients seeking emergency department care for chest pain; it was found that in the 30 percent of patients diagnosed with CVD, 34 percent also met criteria for Panic Disorder (Fleet & Beitman, 1998). Further, Eifert and colleagues (2000b) suggest that despite methodological differences between studies, Panic Disorder occurs in at least 25-30 percent of people presenting with chest pain and no or minimal Cardiac disease (e.g., Beck et al., 1990; Fleet & Beitman, 1998). It is suggested that the high prevalence of Panic Disorder in medical settings may be related to an undiagnosed and more clinically specific Heart Focused Anxiety (Barsky, 2001; Eifert et al., 2000b; Zvolensky et al., 2008).

The literature provides convincing evidence to suggest that HFA is a discrete clinical condition that can be separated from Panic Disorder and generalised Health Anxiety. "HFA has been proposed to be related to, but more specific than other psychological factors that have been linked to the development and maintenance of anxiety problems" (Eifert, et al., 2000a, p. 1040), including Trait Anxiety and Anxiety Sensitivity (Eifert et al., 2000a; Eifert et al., 2000b; Marker et al., 2008; Zvolensky et al., 2008). Anxiety Sensitivity and Trait Anxiety are understood to precipitate anxiety responses based on the fear of negative physical or psychological consequences of body sensations on a general level (Taylor & Cox, 1998), however factor analysis indicates that these constructs are multifaceted at lower levels of analysis (Cox, Parker, & Swinson, 1996; Taylor & Cox, 1998). Thus, at the lower level of analysis HFA is conceptualised to be a specific anxiety condition pertaining exclusively to the fear of cardiac-related events, sensations and the heart's functioning (Eifert et al., 2000a; Eifert et al., 2000b; Zvolensky et al., 2008).

In support of this, research indicates that the fear of bodily sensations is composed of specific dimensions, which can predict anxious and fearful responding across populations with different types of interoceptive concerns (Aikens et al., 2001; Schmidt, 1999). Furthermore, these dimensions are proposed to be associated with differing aetiologies (Beck, Shipperd, & Ohtake, 2000; Cox, 1996; Eifert et al., 2000b; Schmidt, 1999). For example, Aikens et al. (2001) found when examining symptoms that are most fear provoking in NOCP patients, cardiopulmonary symptoms were significantly more fear-provoking than other panic-related symptoms such as numbness, dissociation or gastrointestinal sensations. Furthermore, the level of cardiopulmonary fear was the best predictor of the intensity of complaints regarding the heart and its functioning.

Indeed, the notion of Panic Disorder as a single category has been challenged in the literature (Beck et al., 2000; Eifert et al., 2001; Schmidt, 1999). As with other anxiety conditions in which fear of bodily sensations is central, Panic Disorder should be differentiated by the symptoms that are most emotionally and physically salient for a patient during a typical panic attack (e.g., respiratory, gastrointestinal, or cardiovascular) (Aikens et al., 2001; Aronson & Logue, 1988; Beck et al., 2000; Schmidt, 1999). A study utilising a CO2 inhalation challenge task, examined 56 Panic Disorder patients and found that the patients' fear of cardiorespiratory sensations, (sensations commonly produced by the challenge) predicted negative emotional responding. This response can be contrasted with the panic patients who feared sensations less commonly induced by the CO2 challenge (gastrointestinal discomfort or numbness), whom responded with significantly less negative emotion (Schmidt, 1999).

The literature also indicates that HFA should be considered as separate and more specific than generalised Health Anxiety (e.g., Eifert et al., 1996; Eifert et al., 2000b; Zvolensky et al., 2008). Eifert et al. (1996) have shown that patients with high HFA, score approximately one standard deviation lower than hypochondriasis patients on most Illness Assessment Scale subscales and suggest that this indicates illness beliefs and behaviour in HFA patients are less generalised and more specifically cue-controlled by heart sensations and other cardiac-related input than patients with hypochondriasis. They suggest that field research examining high HFA patients' response to cardiac stimuli provides support for the differentiation of HFA from other health anxiety conditions. For example a study utilising twenty-four hour ambulatory heart rate monitoring demonstrates that high HFA patients tend to misinterpret chest pain, tachycardia and other benign cardiac events as indicative of life-threatening heart disease and respond with anxiety to the perception of such events more than low HFA participants (Pauli, Marquardt, Hartl, Nutzinger, Holzl, & Strain, 1991). Other research using similar methodology indicates that individual high in heart-related vigilance regardless of organic pathology (i.e., MI, angina/arrhythmia, or NOCP) tended to attach more importance to perceived heart symptoms in real life settings than those low in heart-vigilance, resulting in increased health protective behaviour in those identified as high in heart-vigilance (Kohlman, Ring, Carroll, Mohhiyeddini, & Bennett, 2001).

Finally, Eifert and colleagues (Eifert et al., 1996; Eifert et al., 2000; Zvolensky et al., 2008) comment that often the constellation of anxiety symptoms that a potential cardiac patient presents with does not meet full criteria for a DSM-IV-R (2000) disorder and therefore often go unnoticed, this is because patients often present with only limited-symptoms of anxiety, primarily that of chest pain and cardiorespiratory symptoms (Bass, 1990). Eifert et al. (2000b) suggest that this provides further evidence for the discrete nature of heart-related anxiety. It is concluded that to date the research evidence provides some merit in considering HFA as a separate clinical condition and justifies the selection of HFA participants in the following empirical study.

HFA and Biopsychosocial Outcomes in CVD and NOCP Patients

The presence of a specific HFA in CVD patients is highly predictive of poorer physical and psychosocial outcomes (Eifert et al., 2000b). For example, HFA can cause and worsen angina attack severity and frequency and increase the probability of cardiovascular death (Fleet & Beitman, 1998). In the literature HFA is considered both a direct and indirect risk factor in the development and maintenance CVD (Barsky, 2001). Logically, HFA and CVD outcome studies mirror much of the outcome study literature on CVD and general anxiety discussed earlier, however based on current models of HFA (Eifert et al., 2000b; Ratcliffe et al., 2006) it is argued that a specific heart-related anxiety may lead to particularly negative outcomes in CVD patients. This is theorised to be due to the specific effect of HFA on CVD illness cognitions, heart-related information processing and consequent unhelpful illness behaviour and is discussed in detail in the following Chapter. Furthermore, the outcome studies exploring the links between anxiety and CVD to date may not have captured the true impact of a specific HFA. This is due to an inconsistency in the anxiety definition used in this type of research (Suls & Bunde, 2005; Roy-Byrne et al., 2008), as a result it is not completely clear what anxiety construct is linked to the poor outcomes reported. The literature regarding outcomes in recurrent NOCP patients and specific HFA versus a more general anxiety is less confusing because much of the research has been based on the premise that recurrent NOCP is caused by a heart-related anxiety (Barsky 2001). Nevertheless, it is recommended that future research clearly defines the anxiety construct being considered and that well validated and standardised testing tools are utilised. Further, it is recommended that a measurement of both trait anxiety and more specific disorders be considered to enable clarification regarding what type of anxiety most affects outcomes. This approach was adopted in the following empirical component of this study.

Thus, HFA is believed to be a discrete clinical condition, which is a direct and indirect contributing factor in the cause and maintenance of CVD (Barsky, 2001). It is also associated with the cause of recurrent NOCP and the negative outcomes documented in this population (Eifert et al., 2000b; Zvolensky et al., 2008). Current HFA models (Eifert et al., 2000b; Rafcliffe et al., 2006) suggest that the underlying mechanisms that create these associations are common to CVD and NOCP populations. The next chapter examines the cognitive model of HFA and its proposed underlying mechanisms in detail.

Chapter 6

The Theoretical Model of Heart Focused Anxiety

The Cognitive-Behavioural Model of Heart Related Anxiety

Beck's Schema theory of clinical anxiety suggests that different anxiety conditions are associated with specific cognitive content (i.e., fear and worry about specific stimuli), which is stored in the form of cognitive schemas (Beck, 1976; Beck, Emery, & Greenberg, 1985). Schemas can be understood as idiosyncratic mental models of the world and essentially operate to guide the intake of information towards schema-congruent, and in the case of anxious individuals, threat-related elements of the environment which introduces systematic bias into information processing (Beck et al., 1985). This theory has been applied to HFA and central to the model is the proposition that individuals with HFA hold negative illness beliefs concerning their heart and its functioning (Eifert et al., 1996; Ratcliffe et al., 2006; Zvolensky et al., 2008).

When considering the aetiology of HFA it is useful to clarify the definition of illness schema and illness representation and their relationship to each other. Although the terms illness representation and schema originate from different areas in psychology (Health Psychology and Cognitive Psychology respectively) they represent similar concepts and illness representations are embedded into a much larger literature regarding schemas. Specifically, schemas are considered to be a cognitive representation of a particular stimulus domain, which is hierarchically structured and comprised of abstract and more general information at the top and specific information regarding the area in question at its base (Augoustinos & Walker, 1995). An illness representation as defined by Leventhal et al. (1997) is considered to be a "base" component of a schema domain regarding illness and contains specific information about that illness (Henderson, Hagger, & Orbell, 2007). For clarity, illness schema will be used from this point forward to describe the individual's cognitive representation of heart- related illness and sensations in a general sense (because illness representations as defined by Leventhal et al. (1997) are encompassed in this definition). The label illness representation will be used when referring to the specific construct as outlined in chapter three.

Although a considerable portion of the HFA model has yet to be experimentally validated (Eifert, 1992; Eifert & Forsyth, 1996), researchers (Barsky, 2001; Eifert et al., 2000b; Ratcliffe et al., 2006; Zvolensky et al., 2008) propose that the HFA model is consistent with the current cognitive-behavioural models of Panic Disorder (Clark, 1986) and Health Anxiety (Warwick & Salkovskis, 1990).

The Development of HFA

In accordance with established models of Health Anxiety (Warwick & Salkovskis, 1990) and Panic Disorder (Clark, 1986) theorists such as Eifert et al. (2000b), Ratcliffe et al. (2006) and Zvolensky et al. (2008) suggest that uncertainty in both CVD and NOCP patients regarding what a perceived cardiorespiratory sensation may indicate is proposed to play a primary role in the initial development of HFA. This is because uncertainty forces an individual to interpret a sensation's meaning by drawing upon existing illness representations regarding the symptom. However illness representations are often inaccurate (Leventhal et al., 1997). Indeed inaccurate illness beliefs regarding the heart are proposed to maintain the problematic heart anxiety in this population (Eifert et al, 2000b; Ratcliffe et al., 2006; Zvolensky et al., 2008).

In the case of NOCP patients, the initial chest-pain experience is likely to be an un-cued "false alarm" due to a number of unpleasant changes in the body, probably related to hyperventilation and chest muscle tension (Eifert, 1992; Zvolensky et al., 2008). Research indicates that hyperventilation may induce spasm and strain in the intercostal muscles and joints of the precordium, resulting in sensations of chest pain, palpitations and numbness or tingling in the extremities (Lum, 1987).

In the early days of recovery, patients with CVD, commonly experience both cardiorespiratory discomfort of an organic nature and elevated anxiety (Lane et al., 2002). As explained, elevated anxiety can lead to hyperventilation and resultant uncomfortable cardiorespiratory symptoms (Lum, 1987). Due to the considerable overlap in CVD and anxiety symptomatology (Warwick & Salkovskis, 1990), any sensations similar to the CVD related symptoms experienced as part of the illness is likely to attract the patient's attentional resources and lead to increased anxiety (Warwick & Salkovskis, 1990). This response is commonly part of a functional response to potential threat (Beck et al., 1985), but in the case of HFA patients this mechanism is overly sensitive and the threat presented by the cardiorespiratory symptom is overestimated (Eifert, 1992; Eifert et al 2000b; Ratcliffe et al., 2006).

Thus, following the perception of the cardio-respiratory sensation, both groups predisposed to HFA will selectively direct their attentional resources towards cardiac symptoms and make a catastrophic interpretation of the sensations as directed by their illness schemas (i.e., "my heart is faulty, I'm having a heart attack"). In the HFA model, responding with fear to cardiorespiratory symptoms (regardless of origin) cues further anxiety, cardiorespiratory symptoms, hypervigilance (attentional bias towards heart-related stimuli in accordance illness schemas) and so on.

Therefore the illness schemas held create a negative self-perpetuating pattern of anxious responding and attentional bias towards heart-related stimuli, leading to the interpretation of cardiorespiratory sensations and information as catastrophic (Ratcliffe et al., 2006). Individuals with HFA then begin to associate cardiorespiratory sensations with other types of stimuli and activities that have preceded and accompanied previous episodes. Subsequently, even thoughts regarding the activities or related stimuli may increase anticipatory anxiety and physiological changes, resulting in avoidant behaviour and consequent strengthening of the anxiety condition (Zvolensky et al., 2008). The HFA model attempts to account for why not everyone who experiences cardiorespiratory discomfort develops problematic heart-related anxiety.

As highlighted earlier, Eifert (1992) has proposed that individuals with HFA differ from non-anxious and other anxious individuals because of their perceptual sensitivity and attentional bias towards cardiorespiratory sensation and their interpretations of this information. The HFA model attributes this in part to previous observational learning and conditioning experiences that encourage the production of dysfunctional illness schemas regarding the heart and reinforce fearful responding to cardiac cues. Empirical literature reveals an association between the exposure to others' cardiac symptoms and participant symptoms reporting and help-seeking behaviour (Aikens et al., 1999a; Eifert & Forsyth, 1996). For example research indicates that a heart-related interpretation of a false alarm is more likely if the person has been exposed to cardiac disease either in themselves or in others and/or has observed the death of others due to CVD (Aikens et al., 1999a; Eifert et al., 1996; Ratcliffe et al., 2006) and is linked to a higher prevalence of emergency room use and cardiac distress symptoms (Aikens et al., 1999a).

To explain these findings, Eifert (1992) proposes that the individuals' past learning experiences sensitise the HFA individual to cardiac information, and encourage the development of illness behaviour, inappropriate labelling and cardiac interpretation of arousal. Therefore, in accordance with a stress-diathesis formulation, learning experiences (e.g., exposure to cardiac illness, and environmental experiences leading to emotional regulation skills deficits) in conjunction with genetic and biological predispositions (i.e., overly reactive central nervous system) mediate the individual's response to current stressors and can set the scene for the development and maintenance of HFA (Eifert 1992; Ratcliffe et al., 2006; Zvolensky et al., 2008). This thesis does not focus on the developmental aspects of HFA, but rather how the condition manifests itself and is maintained. The three components of Eifert et al.'s (2000b) theoretical model of HFA will now be presented.

The Three components of Eifert et al's (2000b) HFA Model

There are three distinct cognitive-behavioural components in Eifert et al's (2000b) model of HFA. The first is a fear and worry about CVD and cardiorespiratory sensations (presence of a negative illness schema), second, excessive heart monitoring and heart-focused attentional bias, and finally help seeking and reassurance behaviour coupled with the avoidance of activities believed to elicit cardiac related symptoms

(Eifert et al., 1992; Eifert et al., 1996; Eifert et al., 2000a; Eifert et al., 2000b). Each of these components will be considered in turn.

Illness schemas: Fear and Worry Regarding the Heart

As outlined earlier, it is proposed that HFA is associated with characteristic cognitions, of which a fear of the heart as faulty is central (Eifert, 1992; Eifert et al, 2000a; Eifert et al, 2000b). In support of this, research indicates that CVD patients with HFA have more negative cognitive and emotional representations of their CVD than low anxious patients. Furthermore they perceive more somatic symptoms and consider a larger portion of the symptoms to be cardiac related. They also generate less normalising attributions for cardiac symptoms when compared to patients low in anxiety (Ratcliffe et al., 2006) and display a biased perseverance towards a somatic attribution for cardiorespiratory sensations (Koehler, 1991). As reviewed earlier, similar findings regarding content-specific negative beliefs regarding the heart have been reported in NOCP patients with high HFA (i.e., Aikens et al., 2001; Eifert et al., 1996).

As highlighted through the discussion of illness representations, negative attributions regarding health and illness have been identified as a significant cause of dysfunctional affect and conduct, and these findings are consistent with current cognitive models of Health Anxiety (Jopson & Moss-Morris, 2003; Williams et al., 1997). Current research indicates that anxious responding in HFA individuals can be predicted by the degree of congruence between the individual's fear (illness schemas) and the cues present in the internal and external environment. For example, research has found that patients with NOCP display low pain tolerance for cardiac-related stress tests, but this does not generalise to other types of pain stressors such as the finger pressure test (Bradley, Richter, Scarinci, Haile, & Schan, 1992).

The HFA model suggests that HFA is maintained through a heightened perception and misinterpretation of bodily sensations that are congruent to an illness schema regarding the heart as defective (Eifert et al., 2000b; Ratcliffe et al., 2006). This is linked to an increase in bodily vigilance and therefore increases the perception of more sensations (Ratcliffe et al., 2006), increasing selective attention to confirmatory evidence (Cioffi, 1991) and biasing further interpretation of external and internal stimulus to confirm the existing schema. These findings are consistent with research discussed earlier in the illness representation area (e.g., Henderson et al., 2007; Leventhal et al., 1997). In the HFA population this leads to cardiorespiratory symptoms being interpreted as confirmation of heart disease and information that may suggest good health or normal heart functioning is ignored or discounted (Cioffi, 1991). Empirical research indicates that a persistent vigilance towards cardiac-sensations is linked to a tendency to interpret these sensations as threat-related (Kohlmann et al., 2001). For example, one study revealed that individuals with CVD and high HFA interpreted the arousal of everyday life (exercise, emotion and sexual excitement) as threatening (Taylor, Bandura, Ewart, Miller, & DeBusk, 1985).

Thus, fears regarding the heart lead to a cognitive response that increases anxiety and strengthen the existing dysfunction illness schema regarding the heart (Eifert et al., 2000b). Yartz, Zvolensky, Gregor, Feldner and Leen-Feldner (2005), examined the role of perceived health status in predicting anxiety symptoms and bodily vigilance. They found that perceived poor health incrementally predicted the presence of bodily-orientated catastrophic thinking, HFA and anxious arousal symptoms in a sample of "normal" participants (N=71). These researchers conclude that illness representations are an independent risk factor in the development of health anxiety-related problems. Therefore how an individual perceives their health can be considered a cognitive vulnerability factor for health anxiety-related conditions such as HFA Thus biases in attentional processes related to negative illness schemas significantly contribute to the aetiology of anxious responding and is the second component in Eifert et al.'s (2000b) HFA model.

HFA and Negative Attentional Biases

Theory and limited experimental research has linked HFA to a specific attentional bias towards cardiac-related stimuli and sensations in which patients preferentially monitor interoceptive sensations such as their heart and pulse (Aikens et al., 1999b; Aikens et al., 2001; Carmin et al., 2003; Friedman, 2000) and external cardiac related information such as doctors comments (Eifert et al., 2000b). The attentional bias towards negative heart-related information is theorised to occur at both the subliminal and supraliminal level of information processing and serves to amplify anxious responding to both real and imagined cardiac-related events, producing and maintaining anxiety-related responding and reducing health-promoting behaviours (Eifert et al, 2000b). Subliminal processes are proposed to be particularly relevant to the following research study because a number of studies indicate that a significant proportion of illness related self-regulatory behaviour operates outside of conscious awareness (Baragh & Chartrans, 2000). However, despite experimental evidence of selective attentional biases to personally relevant stimuli in the literature regarding general anxiety (e.g., Mathews & MacLeod, 1994), Panic Disorder (Asmundson, Sandler, Wilson, & Walker, 1992; Kroeze & Van Den Hout, 2000), Health Anxiety (Lim & Kim, 2005; Owens et al., 2004) and individuals with physical disease (Asmundson & Hadjistavropoulos, 2007; Fortune et al., 2003), only one study to date has experimentally examined attentional processing biases in CVD patients using a well established measure of attentional bias (Constans, Mathews, Brantley, & James, 1999). That study did not examine HFA, and excluded participants with psychiatric comorbidity. These authors suggest that patients with clinical anxiety conditions such as HFA might have different attention allocation strategies than non-psychiatric patients. No studies to date have specifically examined HFA and attentional bias in CVD and non-CVD individuals. Experimental confirmation of this key process is necessary to provide validity to the HFA model (Eifert et al., 2000b). The next three chapters review the current empirical evidence on attentional biases in a variety of anxiety conditions and health conditions to provide evidence to support the presence of the proposed heart-specific negative attentional bias outlined in the theoretical models of HFA (Eifert et al., 2000b; Ratcliffe et al., 2006).

Help Seeking and Avoidance Behaviours

HFA patients' attentional bias towards cardiorespiratory symptoms is linked to the third component of the model, exhibited in the health behaviours of HFA individuals. These behaviours involve seeking out unnecessary treatment such as invasive diagnostic procedures (Aikens et al., 2001; Eifert et al., 2000b; Friedman, 2000) and in the avoidance of cardiorespiratory sensations and cues (Eifert et al., 2000b, Zvolensky et al., 20008).

The help/reassurance seeking behaviour consistent with the cognitive model of generalised Health Anxiety (Warwick & Salkovskis, 1990), is performed by HFA individuals to reduce worry and anxiety (Eifert, 1992). However, research suggests, that medical reassurance may not be effective in reducing illness conviction for those high in HFA. For example, in one study looking at individuals with NOCP, 51 percent of participants reported that the symptoms improved for less than one day following reassurance. All patients showed a reduction in anxiety and belief that their symptoms were serious, but those initially classified as "very anxious" experienced a return of anxiety and seriousness beliefs when assessed the next day, as well as at one-year follow-up, unlike the less anxious patients (Aikens et al., 1999a).

In accordance with cognitive-behaviour models of Health Anxiety (Warwick, 1989) avoidance of cardiac-related stimuli and sensations has been observed in HFA individuals. Findings suggest that individuals with HFA are significantly more likely to avoid psychological and physical activities that are believed to produce cardiac distress (Aikens et al., 1999a; Aikens et al., 1999b; Eifert, 1992; Zvolensky et al., 2008). This is because the HFA patients' illness schemas encourage the avoidance of the sensations that they perceive to be dangerous and threatening. Ironically, this leads to the sensations being more poorly tolerated, creating increased sensitivity, elevated anxiety and further enhances the attentional bias towards cardio-respiratory sensations and information (Aikens et al., 1999b; Eifert et al., 2000b). Compounding the situation further, the avoidance of physical exercise is likely to result in further loss of physical fitness increasing the chance of heightened cardiac sensations (Eifert et al., 2000b).

Therefore as a consequence of negative reinforcement through sensation escape, in addition to constant health checking behaviour, patients are likely to experience a reduction in exposure to contingencies that would otherwise promote increased activity, habituation to cardiac sensations and the acquisition and reinforcement of more adaptive illness schemas regarding cardiac-related sensations (Aikens et al., 1999b; Eifert et al., 2000b; Zvolensky et al., 2008).

In summary, the HFA model proposes that elevated HFA is associated with a content-specific schema regarding the heart as faulty, this results in a hypervigilance to internal and external heart-related information through attentional bias towards heart threat and encourages individuals to engage in counterproductive behaviour to manage their heart focused anxiety. This in turn creates a negative self-perpetuating cycle of HFA and increases the direct and indirect risk factors linked in part to the development and maintenance of CVD. A summary of HFA and its underlying mechanisms is presented in a multifactorial model of HFA for individuals with or without CVD in Figure 6.1.

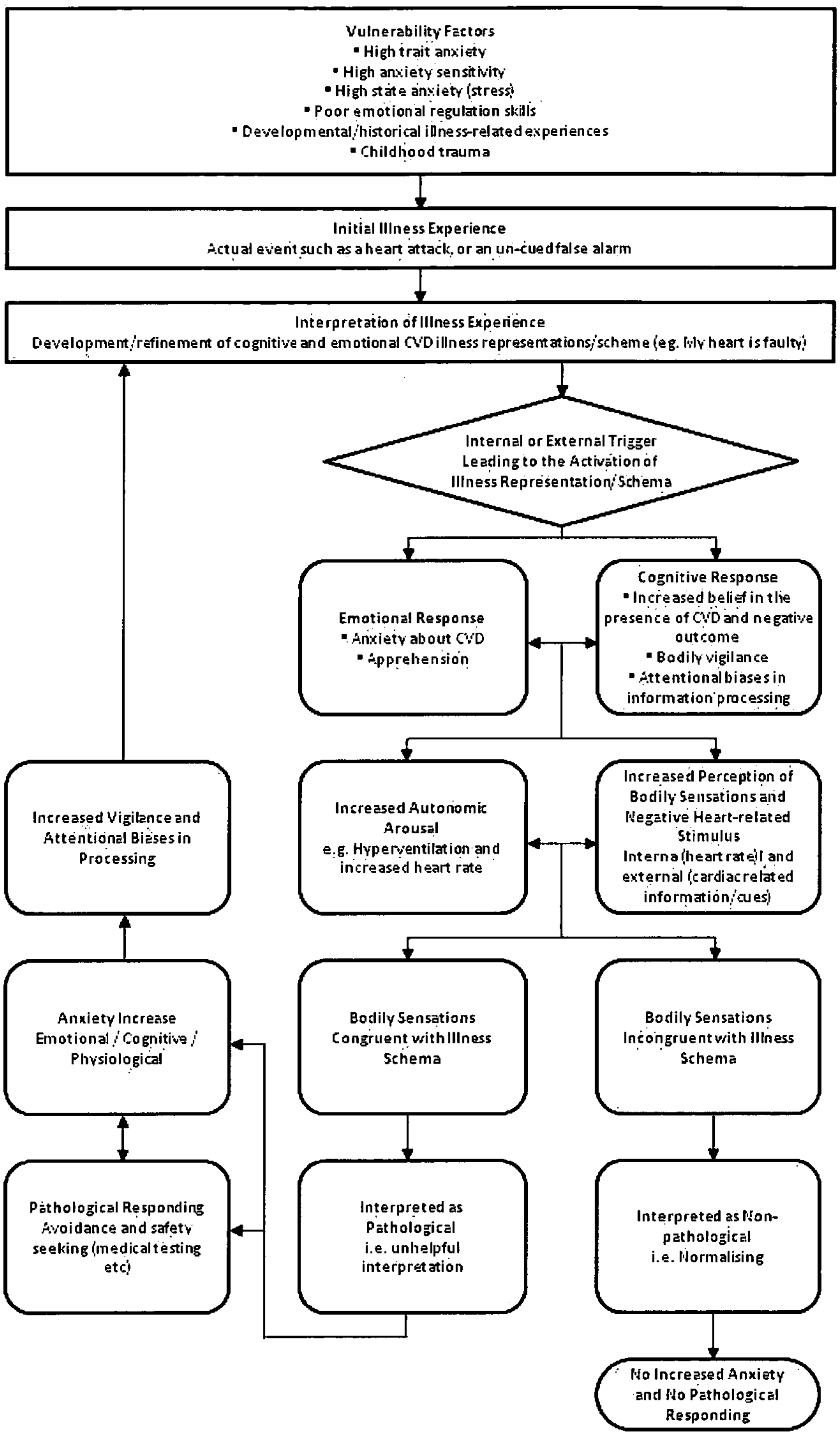


Figure 6.1: Hypothesised mechanisms in HFA for individuals with or without an organic cardiovascular disease (Adapted from Eifert, 1992; Eifert et al., 2000b; Ratcliffe et al., 2006).

The multifactorial model of HFA for individuals with or without CVD does not directly address why only some people with HFA may go on to develop a CVD, while other do not. It is proposed that the manifestation of an organic heart disease is due to the interaction of the above processes with other known risk factors (e.g., genetic predisposition to CVD, socio-economic status etc) (Barsky, 2001; Frasure-Smith & Lesperance, 2008; Ratcliffe et al., 2006; Schwartz, Trask, & Ketterer, 1999). Thus a stress-diathesis concept as discussed earlier is best applied to address the variation in physical outcomes in individuals with HFA.

In conclusion, despite a number of studies that have examined HFA's effect on health behaviour in addition to the proposed conceptual models of HFA (Eifert et al, 2000b; Ratcliffe et al., 2006) there remains a scarcity of empirical data regarding the underlying cognitive processes leading to and maintaining HFA (Aikens et al., 1999b; Zvolensky et al., 2008). Given this, attentional bias and its role in the aetiology of HFA will be the focus of the current study. To aid in the development of sound hypotheses regarding HFA and attentional bias, an examination of the general models of anxiety and anxiety-related attentional bias follow in the next chapters.

Chapter 7

Cognitive Models of Anxiety and Attentional Bias

In this chapter, the main theoretical models of anxiety and methodologies employed in the testing of attentional bias will be presented and the evidence regarding their validity will be considered. This is presented to provide theoretical and empirical support for the model of HFA presented in chapter six and particularly to provide evidence to support the key role accorded to negative attentional processing in HFA. As a result there will be an examination of mediating factors that are empirically linked to the pattern of attentional bias displayed. Given the lack of empirical evaluation of attentional bias in HFA specifically, this information will be used in the development of precise and testable hypotheses regarding the HFA population.

Attentional Bias In Non-Clinical Populations

To explore disordered attentional processes, it is useful to consider functional biases in attention which are fundamental in aiding humans to manage the complex external and internal experiences they are confronted with. To manage these experiences hard-wired attentional processes such as selective attentional biases are essential in enabling humans to efficiently select relevant information for further processing and to disregard that which is irrelevant (see Mathews & MacLeod, 2002 for a review). Research indicates that humans display selective attention to certain information, influenced by their current physical condition, context and emotional state (LeDoux, 1996). Theorists suggest that the deployment of attention towards or away from a perceived threat serves a self-regulatory purpose because it controls the amount of threatening information processed and prevents or facilitating the appropriate elicitation of arousal

(Applehans & Luecken, 2006; LeDoux, 1996). It is widely accepted that the primary role of fear is to facilitate this process (Beck et al., 1985). Research has found a close association between brain mechanisms underlying attention and those underlying fear (Fox, Russo, & Dutton, 2002), providing evidence of the close link between emotion and attentional processes and their role in the facilitation of adaptive behavioural responses in the general population. An empirical understanding of normal emotional functioning can contribute to knowledge regarding anxiety disorders, such as HFA, in which a different and unhelpful pattern of attentional bias has been found to take place (Eifert et al., 2000b; Ratcliffe et al., 2006).

High Anxiety and Negative Attentional Bias

Over two decades empirical research using a variety of paradigms has confirmed that individuals with clinical anxiety disorders display a habitual attentional bias toward threatening, especially when under stress. (For a review see Bar-Haim et al., 2007; Mathews & MacLeod, 2002; Williams et al., 1997). For example, attentional biases have been found in patients with Generalised Anxiety Disorder (Bradley, Mogg, Millar, & White, 1995; Bradley, Mogg, White, Groom, & de Bono, 1999; Mogg & Bradley, 2005; Mogg, Bradley, Williams, & Mathews, 1993a), Social Phobia (Ononaiye, Turpin, & Reidy, 2007), Specific Phobia (van den Hout, Tenney, Hujgens, & de Jong, 1997), Post-Traumatic Stress Disorder (PTSD, Harvey, Bryant, & Rapee, 1996), Panic Disorder (Carter, Maddock, & Magliozzi, 1992; Kroeze & van den Hout, 2000; Lundh, Wiikstrom, Westerlund, & Ost, 1999; McNally, Riemann & Kim, 1990) and Health Anxiety (Owens et al., 2004). Additionally, attentional bias has been found in non-clinical HTA populations (e.g., Holmes, Bradley, Kragh Nielsen, & Mogg, 2009; Mogg et al, 2000b). In support of the reliable nature and robustness of this phenomena a recent meta-analytical study examining attentional bias towards threat based on 172 research studies found an effect size of d = .45. They concluded that negative attentional bias is reliably demonstrated under various experimental conditions and using different experimental paradigms (Bar-Haim et al., 2007).

Empirical evidence to date suggests that attentional biases are critical in the development and maintenance of heightened anxiety and clinical anxiety disorders (e.g., Bar-Haim et al., 2007; Koster, Crombez, Verschuere, & de Houwer, 2006a; Macleod et al., 2002, Mathews, 1990; Mathew & MacLeod, 1994; Mathews & MacLeod, 2002; Mogg & Bradley, 1998; See, MacLeod, & Bridle, 2009; Williams, Watts, MacLeod, & Mathews, 1988, 1997). This is due to the self-perpetuating cycle of anxiety discussed earlier, by which increased attention to threatening stimuli has been proposed to increase the encoding of information regarding potential threat, facilitating the creation of negative schemas regarding threat and danger which consequently increases anxiety and the tendency to attend to threatening information creating a self-perpetuating relationship between selective processing and anxious responding (Mathews, 1990; Mathews & Williams, 2002). Indeed, research indicates that hypervigilance towards potential danger plays a role in maintaining anxiety even if a threat cue is not present (Thayer & Lane, 2000). Additionally, attentional biases interfere with goal-directed behaviour because attentional resources are directed towards threat and not active problems solving (Eysenck, 1997), theoretically perpetuating the anxiety state due to a lack of problem resolution. The experimental methodologies most commonly used in examining anxiety based attentional bias will now be considered.

Empirical Research on Attentional Bias: Methodological Techniques and Limitations

The two most frequently used cognitive-experimental tasks employed to examine attentional bias are the modified Stroop task and the visual-probe task. Empirical research generally supports the proposition that these paradigms reflect the operation of attentional processes (e.g., Bar-Haim et al., 2007; Cisler, Bacon, & Williams, 2009; Driver, 2001).

The Modified Stroop Task

The modified Stroop colour-naming task requires that participants name the colour a presented stimulus word is written in, whilst disregarding the meaning of the word. Differences in the colour naming speed are taken as an index of the extent to which the words meaning has been selectively processed. Anxious individuals exhibit longer colour naming latencies for threat related stimulus words, signifying that these individuals find it difficult to ignore the emotionally threatening content and are preferentially attending to them (e.g., McNally et al., 1990; Mathews & MacLeod, 1994; Williams, Mathews, & MacLeod, 1996).

Although the modified Stroop task is probably the most commonly employed task to examine attentional bias, it has been criticised because a slow response to threatening stimuli might also result from later processes unrelated to attention (MacLeod et al., 1986; MacLeod et al., 2002; Mogg & Bradley, 2007). MacLeod et al. (1986) suggests that anxious participants might equally process the negative and neutral information, but that the negative stimuli may increase the negative affective state of the anxious participants to a level where it impairs reaction time, because empirical findings indicate that threat may create a slowing or inhibition effect on motor responses

(Algom, Chajut, & Lev, 2004; Mogg, Holmes, Garner, & Bradley, 2008;Yiend & Mathews, 2001). Given that it is uncertain what mechanisms are influencing the participants performance on the modified Stroop task, Mogg and Bradley (2007) suggest that when analysing results derived from the modified Stroop, it is prudent to seek convergent evidence from other experimental sources such as data from the visual-probe task, considered next.

The Visual-Probe Task

Given the problems identified with the modified Stroop task, MacLeod, Mathews and Tata (1986) developed the dot-probe task as a more direct measure of attentional bias. In this task, individuals are presented with pairs of stimuli (i.e., words/pictures). The words are presented for 500ms in the original form of the task (Wilson & MacLeod, 2003) or in subsequent studies, presentation time is varied to assess bias patterns at differing processing levels (e.g., Mogg, Bradley, Miles & Dixon, 2004). Of the stimulus pairs, one is threatening, and the other is neutral. After they are removed from the screen a visual probe (e.g., a dot) replaces one of the two stimuli, and participants are asked to respond as quickly as possible by pressing a forced-choice response key (i.e., where is the probe? or what is the probe?). An index of attentional bias is obtained through the relative latencies to detect probes in each of the two screen positions. The rationale being that participants respond faster to stimuli that appear in an attended rather than unattended part of the screen (Mogg et al., 2000b). Therefore on congruent trials (when the probe replaces the threat stimulus), people will respond faster to the probe than when the trial is incongruent (the probe does not replace the threat word).

Despite some obvious advantages, the visual-probe task has also been criticised because it is only able to present a snapshot view of attentional bias (Holmes et al., 2009; Mogg & Bradley, 2005) and given the repetitiveness of the task, it is only possible to complete 2-3 exposure durations before fatigue becomes an issue (Mogg & Bradley, 2005). Furthermore, several researchers have criticised the use of word pairs as threat stimulus due to their potential ecological invalidity and consequent low threat value (i.e., Mogg et al., 1998; Yiend & Mathews, 2001). However, a meta-analytical study of 172 studies on threat-related attentional bias in anxious and non-anxious individuals concluded that overall the findings do not support the claims that naturalistic stimuli (i.e., photos of heart or erratic ECG) are more potent than word stimuli in inducing an attentional bias. It was revealed that both types of stimuli produce a significant threat-related bias in self-reported high anxious participants at both the subliminal and supraliminal level of processing. Based on this evidence, word stimuli were chosen for this study because words provided a greater choice of stimulus items related to the heart.

Further, care must be taken when devising stimulus words to be used in both tasks because some inconsistencies in the research findings reported might be related to the choice of stimulus words adopted in the studies. For example, in studies examining health anxiety, when disorder specific words are choose which have a inherent negative valence attached (i.e., heart attack), they may be more likely to be perceived as negative for most of the population. This can be contrasted with words, which simply describe a body part or an item (i.e., heart), which may have negative, positive or neutral valence and may be perceived as negative only by the disordered individuals. This may lead to the threat words being perceived as more or less threatening by the control group, which would complicate interpretation of the analysis. Thus the valence of stimulus words adopted must be assessed accessing input from each experimental groups before it is included in the data set to ensure that the words are not interpreted as significantly more negative across the stimulus set or across groups. This approached was adopted in the present empirical study.

Difficulties are also evident in the choice of control words. Whilst most researchers have controlled for factors such as frequency of use and word length, many have failed to control for the homogeneity of control word sets. Based on research findings using the modified Stroop task, Green, Corr & De Silva, (unpublished) suggest that priming may occur if word sets are from the same category. Therefore if target words (all from one categorical area) are compared to control words that do not come from the same category, the strength of the attentional bias noted for the target words may be a result of categorical priming rather than a true attentional bias towards the content of the word. Many studies reporting the presence of negative attentional bias have failed to control for the homogeneity of control words using the modified Stroop and visual-probe task (e.g., Mathews, May, Mogg, & Eysenck, 1990; Williams et al., 2003). Other studies however have controlled for this and have found significant negative attentional bias using both tasks (e.g., Edwards et al., 2006; Lundh et al., 1999; Mathew, Mogg, Kentish, & Eysenck, 1995; Mathews & Sebastian, 1993), indicating that the effects are not likely to be simply a product of priming. Nevertheless the development of homogenous categories is recommended when selecting control words for research and was adopted in the present empirical study.

Unfortunately overall there is a relative scarcity of research on the psychometric properties of the visual-probe and modified Stroop task. Cisler et al. (2009) conclude that despite the lack of psychometric information regarding the tasks, the results across the two tasks converge in a number of areas that allow for conclusions to be drawn. The theoretical models of anxiety-related attentional bias will now be considered and convergent evidence from both the modified Stroop and visual-probe task will be presented in reviewing each model's fit with the current experimental findings.

Theoretical Models of Anxiety and Attentional Bias

A review and understanding of the existing theoretical models of anxiety and attentional bias is necessary when attempting to experimentally validate an underlying mechanism such as attentional bias in a specific anxiety disorder. It is essential that the HFA model be embedded into the larger literature on anxiety and information processing patterns for development of testable hypotheses. In the literature there are several cognitive models that attempt to map the cognitive mechanisms underlying anxiety. However their validity continues to be debated due to inconclusive and contradictory empirical findings (Koster, et al., 2006a). Nevertheless, the models converge in the following three areas, (1) that anxiety is associated with an attentional bias towards threat-related information, (2) that the attentional bias towards threat is automatic and involuntary and (3) that a significant amount of information processing occurs outside of awareness, resulting in attentional bias being at least in part a subliminal process.

As Koster et al. (2006b) suggest the current empirical research supports a model of visual-spatial attention in which the processing of novel stimuli involves three distinct mental operations. The first is an initial brief shift of attention to the stimulus, followed by the engagement of attention with the stimulus and finally disengagement from that stimulus (Posner & Peterson, 1990). Bradley, Mogg, Falla and Hamilton (1998) and more recently Koster, Crombez, Verschuere, Van Damme and Wiersema (2006b) suggest that a fully comprehensive model of anxiety and attentional bias must account for each of the mental operation in terms of its function and effect on attentional processes. In the current theoretical models, opinions differ on the effect that state and trait anxiety has on attention and thus the models differ in the prediction they make regarding the pattern of attentional bias displayed on these three mental operations. To investigate the theoretical models further, a brief review of three cognitive theories will follow. The first model will be mentioned very briefly to provide a theoretical context for the latter two, which will be reviewed in more detail. As specified this will be undertaken in order to apply the concepts of these well tested models to the HFA model to highlight what aspects of HFA attentional bias may require experimental exploration.

Schema Theory

As discussed at the beginning of chapter six, Schema theory proposes that cognitive processing in all humans is directed by schema that determines how information is attended to processed and stored (e.g., Beck et al., 1985; Beck & Clark, 1997). More specifically, in the application of Schema theory to anxiety, a three stage-processing model is proposed (Beck & Clark, 1997). The first stage of processing is at the subliminal level and involves dichotomously categorising incoming stimulus as either negative or positive. The second stage of processing is proposed to be both at the subliminal and supraliminal level of processing and involves attentional resource allocation following threat perception. At this stage increased autonomic arousal, protective behavioural responses and a narrowing of processing focus to the perceived threat occur. Finally, the third stage of processing is at the supraliminal level and at this stage idiosyncratic specific fears schemas are activated. It is proposed that in anxious individuals, schemas are bias towards threat (Beck et al., 1985). Because of this, attentional bias towards threat is expected at all levels of processing, including early perceptual (attention and stimulus encoding) and later conceptual processing (memory and interpretation) in high anxious individuals. Schema theory highlights the role of a stable threat schema in HTA individuals (Egloff & Hock, 2001). This corresponds with the existing models of HFA (Eifert et al., 2000b; Ratcliffe et al., 2006) that proposes the presence of specific schema regarding the heart as faulty (Eifert, 1992). Further Eifert et al. (2000b) propose that biased processing occur at both the subliminal and supraliminal levels of information processing, however this has not been empirically validated.

Building on Schema Theory and a number of other information processing models (i.e., Network Theory, Bower, 1981), in addition to empirical data, the last two theories to be discussed propose an interactive effect of state and trait anxiety at specific stages of processing. The Biased Attentional Direction Account (BADA) proposed by Williams et al. (1988, 1997) suggests that the key mechanism leading to anxiety is at the subliminal level of processing and the initial direction of attention, by which those individuals with HTA will attend selectively to threat whereas those with LTA will direct their attention away from threat at the early stages of stimulus processing. This can be contrasted with the Cognitive Motivational View (CMV) (Mogg & Bradley, 1998). In this model the key mechanism underlying attentional bias is seen to be in a shifted attentional function, where all individuals will initially attend to highly threatening information due to its functionality, however HTA individuals will continue to preferentially orientate towards medium and low threat stimulus whereas LTA individuals will direct their attention away through the use of cognitive management strategies.

The Biased Attention Directional Account

The BADA (Williams et al., 1988, 1997) suggests that HTA individuals are overly sensitive to threat stimuli and direct their attention towards threat during the early, automatic stages of processing (Williams et al., 1988). Thus the automatic vigilance for threat is a cognitive vulnerability to the development of pathological anxiety conditions, particularly when the individual is under stress (Mogg et al., 2000b). According to the BADA depicted in Figure 7.1, two key mechanisms lead to negative attentional bias in HTA. The first is the Affective Decision Mechanism that is responsible for assessing the threat value of stimuli; the appraisal is then fed to the Resource Allocation Mechanism, which allocates processing resources based on the Affective Decision Mechanism's output. The actions of the Resource Allocation Mechanism are influenced by trait anxiety. Individuals with HTA are proposed to orientate toward threatening information and those with LTA are proposed to orientate away. Further, the difference in attention bias becomes more obvious as output from the Affective Decision Mechanism increases. Therefore as state anxiety (stress) increases, HTA individuals should become more vigilant compared to LTA who will become more avoidant of threat.

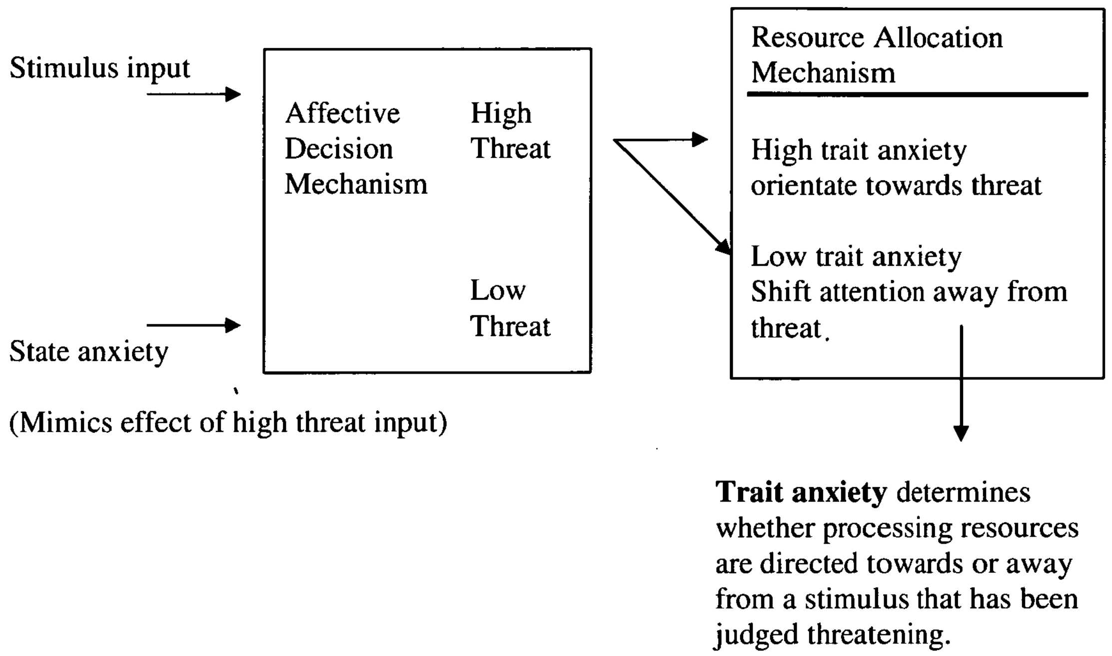


Figure 7.1: Williams et al. (1988, 1997) Biased Attention Directional Account of anxiety based attentional bias (adapted from Mogg, et al., 2000b).

Empirical results regarding the predictions made by the BADA have provided mixed findings. In support of the BADA, a large body of research indicates that detection of the emotional valence of information are made at the early stages of processing and in the absence of awareness (LeDoux, 1996) and that clinical anxiety (e.g., Mogg et al., 1993a) and HTA (e.g., Bar-Haim, et al., 2007) is associated with a subliminal bias towards threatening information. These findings however also support Schema Theory and the CMV. The BADA also proposes that abnormalities in the Affective Decision Mechanism in HTA individuals lead them to adopt a consistently hypervigilant pattern of processing toward threat at the subliminal processing level. This can be contrasted with LTA individuals who are proposed to direct attention away from threat.

A number of empirical research studies have demonstrated a pattern of biased processing which supports the BADA, both in clinical and non-clinical anxious populations (e.g., Egloff & Hock, 2001; MacLeod & Rutherford, 1992). For example an early study of MacLeod et al., (1986) using the dot-probe task reported that clinically anxious participants consistently shifted attention toward threat words, resulting in faster reaction times for probes appearing after such stimuli. Control participants, on the other hand, tended to shift attention away from threat material. This research has been criticised for engaging a small sample number, however Mogg, Mathews and Eysenck, (1992) replicated the results using a more robust sample. An alternative explanation for these findings is that the level of threat evoked by the "threat" stimulus was not strong enough to elicit a threat label in LTA individuals Affective Decision Mechanism (Mogg et al., 2000b). This however does not preclude LTA individuals from displaying a negative attentional bias per se to sufficiently threatening information. Indeed, authors have criticised the ecological validity of the use of written stimuli (e.g., Mogg & Bradley, 1999). Further the stimulus words are rarely chosen to match the LTA individuals current concerns, which may also decrease the threat value of the stimulus. This can be contrasted with the HTA individuals were material is often chosen to match their concerns, which was the case in the studies reported.

This type of attentional pattern has also been found in non-clinical populations. For example, MacLeod and Mathews, (1988) examined students 12 weeks before and one week before a major examination (examining the role of stress and trait status on attentional bias). They found that as state anxiety increased HTA participants' attentional bias towards examination threat words increased on the dot-probe task, this could be contrasted with those individuals with LTA where there was a non-significant increase in avoidance of such material. Other research has also replicated these findings (Mogg, Bradley, de Bono, & Painter, 1997; Mogg, Bradley, & Hallowell, 1994).

Further, in a series of experiments using threatening pictures, Yiend and Mathews (2001) found that HTA individuals orientated towards threatening pictures and those with LTA orientated away regardless of the threat level (experiment 1). Bradley et al. (1998) and Bradley et al. (1997) also reported a similar pattern of attentional bias in experiments using pictorial stimuli. However, Koster et al. (2006a), points out that Yiend & Mathew's (experiment 1, 2001) methodology was very similar to that of Mogg et al.'s (experiment 2, 2000b) however Mogg et al. could not replicate Yiend and Mathews's (2001) findings, rather Mogg et al.'s results provided evidence in support of the CMV model of attentional bias.

Mogg et al. (2000b) are critical of the BADA (Williams et al, 1988; 1997), suggesting that it is counterintuitive in its predictions regarding LTA individuals, because the model proposes that as threat increases, LTA individuals will become more avoidant of threat. Whereas, it would be expected from an evolutionary perspective that an effective threat response system would direct attention towards real or severe levels of threat (Mogg & Bradley, 1998). In support of the CMV, Bar-Haim et al.'s (2007) meta-analytic study based on 172 papers concluded that the evidence to suggest that LTA individuals constantly display a bias away from threatening information is weak.

The Cognitive-Motivational View

The CMV (Mathews & Macintosh, 1998; Mogg et al., 2000b) attempts to address the issue of functional anxiety responding in emotionally healthy individuals (i.e., to objectively high threat stimulus). To do so the model proposes that both HTA and LTA individuals will attend to highly threatening information and orientate away from non-threatening information, but that HTA also direct attention towards moderately threatening information. The CMV as described by Mogg et al. (2000b) is depicted below in Figure 7.2. This model proposes that the Valence Evaluation System, responsible for assessing stimuli for threat, is responsible for the differences in responses. The Valence Evaluation System is proposed to first produce an automatic and rapid analysis of basic stimulus features and then a more detailed analysis, drawing upon interoceptive information regarding current arousal level and past learning. Because HTA is linked to more unhelpful schemas regarding threat, HTA is therefore linked to an increased sensitivity of the Valence Evaluation System and to required lower levels of threat stimuli to elicit a threat label when compared with LTA. Thus HTA individuals display more reactivity to trivial input as they are labelled as having an unrealistic threat value. This information is then provided to a Goal Engagement System, that allocates processing resources. If the stimulus is identified as having a high threat value it will be given a high level of processing resources, if identified as low further processing will cease and the processing resources will remain on current goals. The CMV proposes that all individuals allocate attention to threat at the initial stages of processing, but individual with HTA are proposed to be more sensitive to threat differentiating them for LTA individuals.

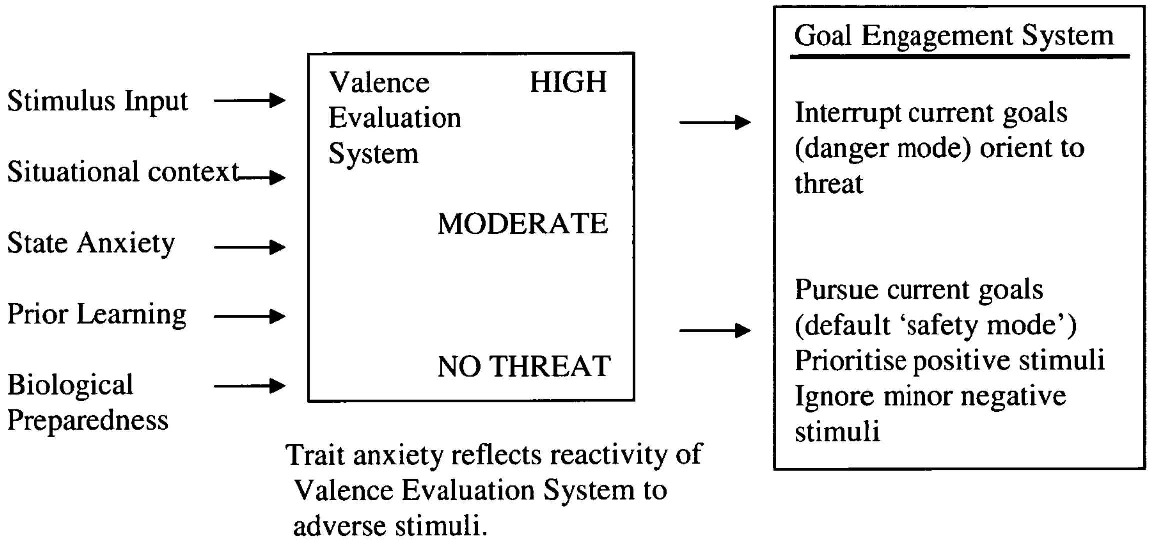


Figure 7.2: Mogg & Bradley's' (1998) Cognitive Motivational Model of anxiety-related attentional bias (adapted from Mogg, et al., 2000b).

Several studies examining attentional bias patterns utilising stimulus of varying threat levels present data in line with the CMV (Koster et al., 2006a; Li, Wang, Poliakoff, & Lou, 2007; Mogg et al., 2000b; Wilson & MacLeod, 2003). For example, in two experiments utilising a pictorial version of the probe-detection task Mogg et al. (2000b) found that attentional bias to threatening information increased in both HTA and LTA individuals as the threat value increased. In addition, in the second study where a larger sample was employed and participants were selected to create clear HTA and LTA groups, the HTA group displayed more vigilance towards lower levels of threat, providing evidence for a more sensitive valence evaluation system. This pattern of bias has been replicated several times; for example Wilson and MacLeod (2003) found that at a low level of threat HTA and LTA individuals orientated away from threatening faces presented in a pictorial dot-probe task, and at a high level of threat both groups orientated towards the faces. But at moderate levels of threat only the

HTA group orientated towards the faces. Likewise, Koster et al. (2006a) using a pictorially based dot-probe task with a sample of 21 HTA and 21 LTA participants, found that all individuals orientate to highly threatening pictures, with HTA individuals orientating more strongly to moderately threatening pictures then LTA individuals. This provides evidence to suggest that the key difference in HTA individuals compared with LTA controls is the intensity of stimulus threat that is required to elicit the attentional vigilance response.

Wilson and MacLeod (2003) argue that findings supportive of the CMV, demonstrate that the outcome of studies contrasting attentional bias scores on only a single set of threatening stimuli may be dependent on the specific threat intensity of the stimuli used. So that only when the threat intensity levels fall in the moderate area will the differences in responding between HTA and LTA individuals be observed. Therefore findings that fail to replicate the difference between HTA and LTA may be a result of overly mild or overly negative stimuli. Therefore there is a strong argument for the use of graded stimulus material in future research investigating anxiety conditions such as HFA. This has been applied to the development and use of high-threat, moderate-threat, positive and neutral stimulus words in the methodology of the empirical component of this project.

Currently no theoretical model can account entirely for the empirical data available. The accumulated body of empirical research on anxiety-related attentional bias suggests a complex phenomenon that is moderated by multiple factors. As a result, a comprehensive theoretical model of HFA must account for each of these moderators. The next chapter examines factors empirically linked to the moderation of attentional bias patterns in order to guide the development of detailed and testable hypotheses regrading biased attentional processing in HFA.

Chapter 8

The Factors Theorised to Moderate Attentional Bias Patterns

Past research indicates that there are a number of factors that affect the pattern of anxiety-related attentional bias. Empirical clarification of these factors is necessary in developing an accurate model of anxiety-related attentional bias in anxiety conditions such as HFA. Hence, this thesis aims to clarify if a number of commonly cited mediating factors in the general anxiety literature are also active in HFA, and if they operate in a similar manner. To inform the development of testable hypotheses this chapter reviews four factors considered key in mediating attentional bias patterns. For the purpose of clarity the literature is reviewed under the headings of the four factors, but evidence suggests that the factors often interact (e.g., Koster et al., 2006b; Lim & Kim, 2005; MacLeod & Rutherford, 1992), interaction effects will be pointed out when necessary. The first factor to be considered is the level at which threatening information is processed. Research indicates that anxiety-related biases might not perform consistently at all levels of processing (Bar-Haim et al., 2007). The second to be considered is whether negative attentional bias is dependent on the threat being specific to the individual's core fear or negative illness schema. The Content-specificity Hypothesis proposes that the strength of the negative attentional bias demonstrated is mediated by the relevance of the threat stimulus to the individual's personal anxiety concerns (Mathews, 1990; Williams et al., 1996). The third factor examines if the stimulus that elicits attentional biases is required to be negative, or simply emotionally valenced. The Emotionality Hypothesis proposes that stimuli may only need to be of an emotive nature (positive or negative) to elicit an attentional bias in anxious individuals (Martin, Williams, & Clark, 1991; Ruiz-Caballero & Bermudez, 1997). Finally, the paper will review whether attentional bias patterns are a consequence of anxious mood (state) or a more enduring personality characteristic (trait anxiety) or an interaction of the two.

The Role of Processing Level

The definition of subliminal and supraliminal information processing continues to be debated in the relevant psychological literature (see Koudier & Dehaene, 2007; Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006 for a review). For the purpose of this project the definition commonly adopted in empirical attentional bias research will be applied (e.g., Beck & Clark, 1997; Bradley, Mogg, & Miller, 2000; Buckley, Blanchard, & Hickling, 2002, Fox, 1996; Luecken, Tartaro, & Appelhans, 2004; Lundh, Wikstrom, Westerlund, & Ost, 1999; Mogg & Bradley, 2006). Hence for the purpose of this study subliminal processing is considered to take place in the first stages of information processing and is automatic and outside of conscious awareness. Conversely, the supraliminal level of information processing refers to cognitive processing in which the stimulus is consciously recognised and is open to strategic and effortful information processing. In support of two distinct levels of processing, neurological research has identified separate neural pathways for subliminal and supraliminal processing. At the subliminal level, information bypasses cortical processing so that at a very basic level of representation potential threat can be quickly identified. In contrast at the supraliminal level, information undergoes cortical processing and conscious and higher evaluative processing (Ohman, 1997). This typology is reflected in the existing theoretical models of anxiety (e.g., Mathews & Macintosh, 1998; Mogg et al., 2000b; Williams et al., 1988, 1997) and HFA (Eifert et al., 2000b). It is acknowledged however that a strictly dichotomous typology of consciousness is unlikely to reflect the functional reality of subliminal processing (e.g., Kouider & Dehaene, 2007). It is suggested that the subliminal processing that the current empirical study will examine is best described as pre-attentive, by which the information may be affected by higher order processes, but the individual is not aware of the information at a conscious level (Bargh & Chartrand 2000; Kouider & Dehaene, 2007). The general term subliminal will be adopted in this study and will refer to the exposure to information that the individual cannot readily and consciously report.

Numerous empirical studies and reviews have examined the degree to which anxiety exercises a consistent influence at both levels of information processing (e.g., Bar-Haim et al., 2007; Beck & Clark, 1997; Macleod & Rutherford, 1992). Overall the research provides evidence for attentional bias at both the subliminal and supraliminal levels of processing in non-clinical and clinically anxious individuals (Bar-Haim et al., 2007; Cisler et al., 2009; MacLeod & Rutherford, 1992; Mogg, White, & Millar, 1995; Mogg et al., 2000b; Williams et al., 1996). This is important because information processing of threat at either the subliminal or supraliminal level may influence the pattern of attentional bias displayed by high and low anxious individuals (Beck & Clark, 1997; Mathews & MacLeod, 1994; Mogg & Bradley, 2006). Furthermore, Cisler et al. (2009) also suggests that the pattern of attentional bias displayed at the two processing levels may provide insight regarding the underlying mechanisms at work in anxiety conditions. Cisler et al. (2009) proposes that subliminal processing may overlap with facilitated attention to threat and that supraliminal processing is more related to difficulties in disengagement from a threatening stimulus. Therefore differential patterns in the timeline of attentional bias may provide some insight into the underlying mechanisms of problematic anxiety.

Empirical research and theory regarding the timeline of the processing of threat also includes the examination of attentional avoidance in HTA individuals, which has been observed when threatening information is displayed longer than 200ms (e.g., Koster et al., 2006b). Based on these observations the Vigilance–avoidance hypothesis has been proposed (e.g., Mathews, 1990; Williams et al., 1988). This hypothesis suggests that HTA individuals may show a vigilant-avoidant pattern of attentional bias in which attention may be initially directed towards processing threat, but once at the conscious level, there is a strategic attempt to avoid detailed processing to minimise emotional discomfort and responding (Mogg et al., 2000a; Mogg et al., 2004). This pattern of attentional bias has been proposed to contribute to the continuation of the anxiety condition by disrupting habituation to fear provoking information (Bar-Haim et al., 2007; Bradley et al., 1998; Mogg et al., 2000b) and is believed to occur secondary to facilitated attention and difficulty in disengagement (Cisler et al., 2009; Mogg et al., 2004).

Subliminal Processing

Research examining subliminal processing involves presenting stimuli for a very short duration (i.e., 14ms) (Mogg et al., 1994). Backward masking is also sometimes used to ensure that the participant has no conscious awareness of stimulus content (e.g., Ononaiye et al., 2007). Other studies have also manually set the presentation speed of the stimulus for each participant to control for individual variations in the level at which stimulus can be consciously perceived (e.g., Edwards, Burt, & Lipp, 2006).

Many studies presenting stimulus at the subliminal level using both the modified Stroop and dot-probe task, support the assumption that negative attentional biases are not dependent on conscious strategies and can be found prior to conscious awareness of stimulus in clinical conditions such as Social Phobia (Ononaiye, et al., 2007), Panic Diorder (Lundh et al., 1999), PTSD (Harvey et al., 1996), Generalised Anxiety Disorder (Bradley et al., 1995; Mogg & Bradley, 2005) and in non-clinical HTA populations (i.e., Edwards et al., 2006; Luecken et al., 2004; MacLeod & Rutherford, 1992; Mogg, Bradley, & Williams, 1995; Mogg et al., 1993a, 1993b; van den Hout et al., 1995). These results are not found in LTA individuals unless they are exposed to a significant level of stress and exhibit elevated levels of state anxiety (Mathews & Mackintosh, 1998).

To date, no empirically based studies have examined HFA and information processing level, although in support of this proposition several studies have found a pattern of negative attentional bias at the subliminal level in Panic Disorder patients, a condition whose underlying mechanisms are theorised to be similar to that of HFA (Barsky, 2001; Eifert et al., 2000b; Ratcliffe et al., 2006). For example, Lundh et al. (1999) examined 38 Panic Disorder patients with agoraphobia on the modified Stroop task and found Panic patients showed significant Stroop interference for panic words at the subliminal and supraliminal level. Interestingly, it was found that the attentional bias index for the subliminal and supraliminal level of processing was not correlated for panic-words. Based on this the authors concluded that the subliminal and supraliminal bias scores were caused by separate kinds of processes. This was supported by the findings that subliminal but not supraliminal interference for panic words correlated with trait anxiety. Thus suggesting that trait anxiety is more associated with subliminal than with supraliminal interference. This finding is consistent with existing theoretical models (i.e., BADA and CMV) that suggest that trait influences on attentional bias occur primarily at the subliminal level of processing (Mogg & Bradley, 1998; Williams et al., 1988,1997).

Cisler et al. (2009) also recently reviewed several studies that provide further support for the contribution of subliminal processing in anxiety-related attentional biases and emotional responding. The studies examine the degree to which subliminal and supraliminal biases predict emotional responding to various types of stressful events among non-clinical individuals. The review included MacLeod and Hagans' (1992) research, which found that the degree of interference on the modified Stroop task at the subliminal level predicted the degree of general dysphoric and anxious and depressive reactions among women about to undergo a cervical examination, but the supraliminal attentional bias score did not predict any type of emotional response. Similarly, van den Hout, Tenney, Merckelbach and Kindt (1995) found that subliminal Stroop interference predicted the degree to which participants expected adverse emotional reactions to varying hypothetical scenarios presented by experimenters, but the supraliminal Stroop interference did not. Finally, Nay, Thorpe, Roberson-Nay, Hecker and Sigmon (2004) found that both masked and unmasked Stroop interference predicted emotional responding during a biological challenge task. Based on these findings, Cisler et al. (2009) concluded that subliminal attentional biases to threat are more consistently related to actual emotional responding than supraliminal attentional biases, which suggest that biases at the subliminal level of processing may be more critical in the aetiology of elevated anxiety.

However, some research has failed to find negative attentional biases at the subliminal level, or has found them only under certain circumstances. For example in a non-clinical population, Fox (1996) was only able to demonstrate subliminal attentional biases after supraliminal priming. More recently, Luecken et al. (2004), also found supraliminal priming necessary to obtain biased attentional processing in non-clinical participants on the dot-probe task at the subliminal level. Both teams suggest that the subliminal negative attentional bias displayed may simply reflect conscious priming, opposed to an independent early processing bias. To avoid this possibility in future research, subliminal trials should be conducted before the supraliminal trials and is adopted in the following empirical assessment of attentional bias in HFA.

Difficulties in finding a subliminal attentional bias have also been experienced when examining clinical populations. For example, Buckley et al. (2002) failed to find attentional bias in Panic and PTSD patients when the threat material was delivered subliminally in a modified Stroop task. These researchers also support a type of priming hypothesis, suggesting that because the sample was not exposed to any fearful stimulus prior to the task, they were not physiologically aroused, thus a lack of heightened state anxiety may be responsible for the negative results. They suggest that because clinical disorders such as PTSD and Panic Disorder are linked to physiological arousal, participants may only demonstrate negative attentional biases under conditions of stimulus cued autonomic arousal. This finding is relevant to HFA, given the proposed role of heightened physiological reactivity in HFA (Eifert, 1992; Eifert et al., 2000b). However, Buckley et al. (2002) did not control or measure state anxiety making it difficult to determine what effect state and trait anxiety had on the results. It is recommended that future research measure and control for state anxiety to enable clarification of any results obtained.

Supraliminal Processing

As discussed earlier, there is plentiful evidence to support the presence of an attentional bias toward threat at the supraliminal level of processing in both clinical and HTA populations (Bar-Haim et al., 2007; Buckley et al., 2002; Koster et al, 2006a; Lundh et al., 1999; Macleod et al., 1986; Mogg, et al., 1995; Mogg, Holmes, Garner, & Bradley, 2008; Yiend & Mathews, experiment 1, 2001), this is because attentional bias research has been most commonly been conducted at stimulus presentation times of 500ms, which primarily captures the supraliminal level of processing as defined in the introduction of this section. Biases have also been seen in LTA individuals under threat conditions linked to elevated state anxiety (Mathews & Mackintosh, 1998).

However, some research has failed to find supraliminal negative attentional biases in clinical anxiety (e.g., Lim & Kim, 2005) and HTA populations. These findings are in line with theoretical accounts of anxiety-related attentional biases such as the CMV and BADA because they predict that biased processing is primarily linked to subliminal processes. For example Luecken et al. (2004) found that non-clinical individuals with moderate levels of trait anxiety avoided threatening information presented at the supraliminal level of information processing. These findings suggest that individuals with non-clinical levels of anxiety may use strategic coping strategies to manage uncomfortable emotional reactions as proposed by the Vigilance-avoidance hypothesis (Mathews, 1990; Mathews & Wells, 2000; Williams et al., 1988). Luecken et al. (2004) also suggest that supraliminal attention bias may be influenced by high state anxiety, which was not present in the given sample of participants and as a result, a negative attentional bias was not seen. This also corresponds with earlier work by MacLeod and Rutherford (1992) with non-clinical participants and the manipulation of the level of processing and state anxiety. They concluded that the pattern of attentional bias demonstrated was affected by state anxiety interacting with the level of processing. Therefore state anxiety must also be considered when examining findings regarding the time course of attentional biases, and will be discussed in detail later in this chapter.

The lack of attentional bias in supraliminal processing has also been found in non-clinical groups with more specific anxiety concerns; for example, Ononaiye et al. (2007) using the dot-probe task with a group of 41 non-clinical high Socially Anxious individuals, found that unlike the subliminal level, there was no evidence of negative attentional bias patterns at the supraliminal level of processing or differences in attentional bias scores between the socially anxious and control group. To explain their findings Ononaiye et al (2007) refer to the work of Dijksterhuis and Smith (2002) who suggest that the lack of findings in supraliminal processing may be a result of habituation to the threat stimulus, which occurs during the first presentation at the subliminal level of processing. This results in a reduced anxiety and thus attentional focus on the supraliminal trails to threatening words.

The Vigilance-Avoidance Hypothesis

Research also suggests that negative attentional bias may be absent at this level of processing because once processing is at a conscious level, some individuals may utilise deliberate and consciously mediated strategies to manage the emotional discomfort produced by the perceived threat (MacLeod & Rutherford, 1992; Mathews & MacLeod, 1994). The Vigilance-avoidance hypothesis proposes one such strategic response to threat related information (Mathews, 1990). Empirical evidence in support of the Vigilance-avoidance hypothesis is readily available in HTA participants (e.g., Koster et al., 2004, 2006b; MacLeod & Rutherford, 1992). The results however are not consistent; Mogg et al. (1997) used a variation of the dot-probe task to examine the effect of stimulus exposure length on attentional bias in a non-clinical population. Word pairs (physical-threat, social-threat and neutral) were presented at 100, 500 or 1500 ms. The results indicated that a higher level of state anxiety were linked to a speeded response to probes replacing both types of threat words, rather than the neutral words at 100ms, with similar non-significant trends at 500 and 1500ms, when compared to participants with low state anxiety scores. Mogg et al. (1997) conclude that this is consistent with a bias in the initial shift of attention towards the threat, with decreasing vigilance to threat as processing times increase. Interestingly in this study the pattern was not evident for HTA participants. HTA was not significantly affected by the duration of the stimulus or its valence. However, participants were not preselected based on their anxiety levels and as a result there were few participants with high anxiety scores.

To explore the specific role of HTA and the vigilance-avoidance hypothesis further, Bradley et al. (1998) investigated the effect of stimulus exposure duration on attentional bias for emotional facial expressions in well defined HTA and LTA groups using the dot-probe task. In the 500ms condition, HTA compared to LTA participants were more vigilant to threat and more avoidant of happy faces. The two groups did not differ significantly in biased scores for threat or happy faces presented at 1250ms. Taken together these two studies indicate that vigilance in high state anxiety and HTA is robust at shorter stimulus durations, but the tendency to maintain attention towards threat may diminish and not be present over longer periods of time. These results however do not provide evidence for a strategic avoidance of threat material at the supraliminal level as proposed by the Vigilance-avoidance hypothesis.

Yet, more recently, Koster et al. (2006b) has shown that HTA individuals displayed an attentional bias towards highly threatening pictorial information at 100ms picture presentation, but at 200 and 500ms they showed rapid attentional avoidance from pictorial threat. Luecken et al., (2004) also found a pattern of vigilance at the subliminal level of processing and an avoidance of threat information at the supraliminal level in 61 HTA participants on the visual-probe task but only when the supraliminal presentation was delivered first. As mentioned previously, Luecken et al. (2004) suggest that supraliminal exposure increases anxiety state and thus leads to increased attentional bias at the subliminal level. This research suggests that other moderating factors such as state anxiety may interact with the timeline of attentional bias to affect the pattern of attentional bias displayed.

Research indicates that the level of processing may interact with other factors to affect the attentional patterns recorded. For example, research suggests that if a threat stimulus is self-relevant (thus highly threatening) then strategic avoidance may take place in non-clinical samples. In support of this, Mogg, et al. (2004) using a pictorial version of the dot-probe task (injury, violence and death pictures) for two exposure durations (500ms and 1500ms) found evidence for a vigilance-avoidance pattern of attention in a non-clinical population. Results showed that, in comparison with LTA, HTA participants were more vigilant for high threat scenes at the short exposure duration, but showed no attentional bias at the longer duration consistent with previous findings. However, the results also indicated significant avoidance of the threatening information at the longer exposure duration for participants high in blood-injury fear. This suggests that if the threat is sufficiently self-relevant (hence threatening) then strategic avoidance may take place.

However, some research has failed to find a vigilant-avoidant pattern in participants using fear stimulus of relevance to the individual. Mogg and Bradley (2006) employing a visual probe task with 21 non-clinical spider phobic participants found that shorter stimulus exposure conditions (100ms) produced rapid, initial attentional bias for fear related stimuli which partially supports the Vigilance-Avoidance hypothesis, But no avoidance was recorded at longer stimulus durations (200ms and 500ms). Similar to Luecken et al., (2004), Mogg and Bradley (2004) have suggested that studies that have failed to find avoidance patterns in non-clinical populations may be because the stimuli fails to sufficiently increase state anxiety and thus to reveal the hypothesised vigilance-avoidance pattern. The role of state anxiety is discussed further in this chapter.

Studies engaging clinically anxious populations have commonly not produced vigilance-avoidance patterns of attention, but rather report a pattern of vigilance at both levels of processing in disorders such as Generalised Anxiety Disorder, Panic Disorder and Obsessive Compulsive Disorder (e.g., Bradley et al., 1995; MacLeod et al., 1986; Mogg et al., 1993a; Mogg & Bradley, 2005).

In summary, these findings provide evidence for the Vigilance-avoidance hypothesis in several specific groups. The groups found to display this pattern of attentional bias include, LTA individuals, if state anxiety is sufficiently high and non-clinical HTA individuals (e.g., Koster et al., 2006b), particularly in participants where the threat material is self-relevant and state anxiety is high (e.g., Mogg & Bradley, 2004; Mogg et al., 2006). To explain these results it has been suggested that non-clinical participants may be able to offset the automatic, subliminal bias for threat-related information by means of consciously controlled strategies to reduce emotional responding when the threat is processed at the supraliminal level. This can be contrasted with clinically anxious patients who are theorised to lack the ability to neutralise their automatic biases by means of conscious strategies (Williams et al., 1997). The presence of a vigilant–avoidant pattern in the processing of cardiac threat stimuli has not been studied in HFA. It is proposed that because HFA is conceptualised as a clinical disorder, a Vigilant-avoidant pattern will not be demonstrated, conforming to the results found in other clinical anxiety disorders (e.g., Bradley et al., 1995; MacLeod et al., 1986; Mogg et al., 1993a; Mogg & Bradley, 2005). These results support Eifert et al.'s (2000b) proposition that negative attentional bias towards heart-threat information will occur at both levels of processing in individuals with high HFA.

Based on a sizable meta-analytic study Bar-Haim et al. (2007) conclude that individual differences in anxiety are most probably driven by both subliminal processes, as reflected by the strong evidence for a bias outside of awareness, and by later resource allocation mechanisms, as reflected by the larger combined effect size for consciously perceived stimuli relative to subliminally exposed threat related information. This indicates that part of the threat-related bias in anxious individuals results from processes that require conscious perception. But it would appear that anxiety-related biases do not operate in a uniform manner at both levels of processing and are influenced by other factors such as the relevance of the threat stimulus to the individual and the level of state and trait anxiety. In summary, the empirical literature provides partial support for the CMV (Mathews & Macintosh, 1988; Mogg & Bradley, 1998) and the BADA (Williams et al., 1988, 1997) because both models propose that the initial evaluation of the stimulus, and the following attentional resource allocation to the threat operate outside of conscious awareness. The current study aimed to examine the effect of processing level on attentional allocation in HFA participants with or without CVD to provide validation and clarification of the underlying attentional processes in the HFA model. To achieve this, the following empirical study examined attentional bias at both the subliminal and supraliminal levels of processing.

Facilitated Attention and Difficulty in Disengagement.

Less theoretically clear from the current literature is whether the presence of a negative attentional bias (towards threat information) reflects facilitated attention towards threat or a difficulty in disengagement from the threat (Cisler et al., 2009). Many argue that findings based on the visual-probe task are unclear because they can be interpreted as evidence for either mechanism (Amir, Elias, Klump, & Przeworski, 2003; Fox, Russo, Bowles, & Dutton, 2001; Koster, Crombez, Verschuere, & De Houwer, 2004; Koster et al., 2006a), yet, traditionally the importance of facilitated attention has been emphasised in the interpretation of empirical research (e.g., Williams et al., 1997) and in theoretical models such as the BADA (Williams et al., 1997) and the CMV (Mogg & Bradley 1998). Nevertheless, recent empirical research employing exogenous cueing paradigms has begun to question this interpretation, reporting evidence to suggest that difficulties in disengaging may actually be responsible (e.g., Fox et al., 2001; Koster et al., 2006b; Yiend & Mathews, experiment 3, 2001). The visual-probe task has also been used to explore this question by comparing reaction times on congruent and incongruent threatening trials with reactions times for a neutral-neutral word pairing. It is argued that faster responding to congruent threatening trials when compared to neutral reaction times will reflect facilitated attention. A delay in reaction times in incongruent threatening trials when compared to neutral reaction times will reflect a difficulty in disengagement (Koster et al., 2004) A number of studies employing this approach suggested that participants with HTA experience disengagement difficulties from threat rather than facilitated attention (Koster et al., 2004; Koster, et al., 2006a; Koster et al., 2006b; Salemink, van den Hout, & Kindt, 2007).

However, more recently Mogg et al. (2008) tested the validity of this approach and concluded that the differences in reaction times between threat and neutral incongruent and congruent stimulus originate from a slowing effect related to threat stimulus opposed to attentional mechanisms. This is consistent with empirical findings that indicate threat may create a slowing or inhibition effect on motor responses (Algom et al., 2004; Yiend & Mathews, 2001). To reach this conclusion, Mogg et al. (2008) employed non-clinical participants high and low in trait anxiety (N=51). Participants first performed a central cueing task that assessed the reaction time slowing effect on angry, happy and neutral faces. The task confirmed a reaction time slowing for angry faces for HTA participants only and a slowing for positive faces in both HTA and LTA. This task was performed before and after the participants performed a standard dot-probe task. The results of the dot-probe task without considering the slowing effect, appeared to support the hypothesis of disengagement difficulties from threat, however when the data was reanalysed taking into account the reaction time slowing effect (adjusting reaction time values to reflect the slowing on emotional cues) the results were then consistent with the bias in HTA being associated with facilitated attention. Mogg et al. (2008) state that the uncorrected and corrected reaction time data produce contradictory conclusions regarding the component involved in producing the demonstrated attentional bias.

Mogg et al. (2008) conclude that using the visual-probe task to evaluate components of attentional bias is not valid. Importantly however, this team concluded that the slowing effect does not affect the attentional bias index score because a threat stimulus is presented on each trial. Therefore any slowing effect to threat will be consistent across all trials. Hence the dot-probe task is suitable for assessing attentional bias presence and direction. Because utilising visual-probe data to directly assess the underlying mechanisms of attentional bias is at best questionable it was not employed in the empirical section of the current study.

The Content- Specificity Hypothesis

This hypothesis is based on Schema Theory (Beck et al., 1985) and is central to cognitive theories of clinical anxiety disorders such as HFA and proposes that the strength of an attentional bias displayed is mediated by the relevance of the threat stimulus to the particular anxiety concerns of the individual (Mathews, 1990; Williams et al., 1996). As discussed in detail previously, this is theoretically important to the model of HFA, because it is based on the premise that individuals high in HFA hold specific fear schema related to the heart as faulty (e.g., Eifert et al., 2000b). Thus a fear-congruent attentional bias may reflect the activation of content-specific schema, representing the threat concerns of the individual (Mogg, Mathews, & Weinman, 1989). Therefore in HFA, unrealistic fear schemas regarding the heart bias the processing of heart-related information and perpetuate anxious responding.

In support of the Content-Specificity hypothesis, empirical evidence indicates that clinically anxious individuals display attentional biases to threat stimulus specific to their diagnosed clinical anxiety condition (i.e., Mathews & MacLeod, 1994; Ruiz-Caballero, & Bermundez, 1997; Woody, Taylor, McLean, & Koch, 1998). This relationship is also found between the HTA population and their personal fears (MacLeod & Rutherford, 1992; Mogg et al., 1994; Ruiz-Caballero & Bermundez, 1997).

Particularly relevant to HFA is the empirical support for content-specific attentional bias in individuals with health related anxiety. For example, in a study examining HTA individuals with predominately physical health related concerns, a greater interference effect was displayed for physical threat words compared to other word types on the modified Stroop task (Mogg et al., 1989). This pattern of bias was also found within a sample of Generalised Anxiety Disorder patients, whose primary concern was health related when exposed to health-related information on the modified Stroop task (Mathews & Macleod, 1985). Similarly, when comparing 242 non-clinical participants assessed as being either high, medium or low in Health Anxiety on the modified Stroop task, Owens et al. (2004) found that participants high in Health Anxiety compared to those lower in Health Anxiety selectively attended to illness-threat related but not other categories of positively and negatively valenced stimuli presented at the supraliminal level of information processing. The results were not affected by state anxiety or general trait anxiety, providing evidence for a schema specific attentional bias congruent with Health Anxiety. However to be confident of the results obtained on the modified Stroop task, convergent evidence on the visual-probe task is also required (Mogg & Bradley, 2007). Findings obtained by Lees, Mogg and Bradley (2005) using a linguistic and pictorial version of the dot-probe task with similar participants and stimulus words at a supraliminal level of processing (500ms/1250ms) failed to replicate Owens et al.'s (2004) results. Rather they found that high and low health anxious individuals' responses to health threat stimulus were not significantly different. Despite these negative findings, they additionally reported that anxiety sensitivity (a fear of negative physical health outcomes caused by physiological symptoms) was related to a greater attentional bias for threat pictures at 500ms compared with those low in anxiety sensitivity, but the bias was not reported in the longer exposure condition. Lees et al. (2005) propose that anxiety sensitivity may capture fears of immediate threat (e.g., increased heart rate leading to imminent heart attack). It is therefore argued that because HFA is proposed to be a lower order factor in anxiety sensitivity (Eifert, 1992; Eifert et al., 2000b) and HFA is related to a fear of immediate interoceptive information (Eifert, 1992) support for the Content-Specificity hypothesis in HFA (Eifert et al., 2000b; Ratcliffe et al., 2006) can be extrapolated from this study.

Studies examining attentional bias in clinical populations with Health Anxiety conditions provide partial support for the Content-Specificity hypothesis. Lim and Kim (2005) found that patients with Somatoform Disorder displayed an attentional bias towards physical threat words compared to other words at the supraliminal level of processing on the modified Stroop task (No effect was found at the subliminal level). However the strength of bias was not significantly different from that in Depressed and Panic Disorder control groups. This suggests a reconsideration of how exclusive fear schemas are between different diagnostic conditions and hence the validity of HFA as a separate and clinically meaningful construct. As a result, further empirical research using the visual-probe task is required to directly investigate this issue with a HFA population.

However, evidence examining other clinical disorder provides evidence to support the proposition that content-specific attentional biases will be present in HFA. This comes from the significant body of evidence supporting specificity in Panic Disorder, a condition whose underlying mechanisms are theorised to be similar to that of HFA (Barsky, 2001; Eifert et al., 2000b; Ratcliffe et al., 2006). These findings are particularly strong because they have been demonstrated using both the modified Stroop and Dot-probe task. For example using the modified Stroop task, Panic Disordered patients and normal controls were compared on their response to panic-threat, general-threat and neutral words. The results revealed a stronger attentional bias for panic words relative to the other threat stimulus at the supraliminal level of processing. The control group did not show differential responding to stimulus type (Carter et al., 1992). Also using the modified Stroop task to examine Panic Disorder patients, Lundh et al., (1999) demonstrated attentional bias at both levels of information processing towards panic-related words, and to a lesser extent to social threat words, suggestive of content-specificity. Content-specificity has also been found using the dot-probe methodology in which speeded probe detection was recorded for physically threatening words but not socially threatening words in Panic Disordered patients when presented at the supraliminal level of processing (500ms) (Asmundson et al., 1992).

Research also indicates that Panic Disorder patients display selective attention towards their own bodily sensations (Kroeze & van den Hout, 2000). This is important to the model of HFA because selective attention has been hypothesised to cause greater interoceptive perception of bodily cues, which increases the likelihood that the feared bodily sensations do occur (Ehlers & Breuer, 1996; Ehlers & Breuer, 1992). For example, Kroeze and van den Hout (2000) examined attentional bias to what participants believed was their own visual ECG information in 19 patients with Panic Disorder utilising the dot-probe task presented at the supraliminal level of processing. Results found that the patients with Panic Disorder gave more attention to the ECG pictures then to the neutral stimuli relative to controls. The speeding up of the ECG information did not increase the strength of the attentional bias in this group. In contrast the normal controls ignored the ECG picture. Taken together these results provide evidence that attentional bias in Panic Disorder patients occur for direct bodily information as well as content-specific words. This provides support for the central role outlined in the model of HFA for an attentional bias towards direct somatic information such as heart rate and other externally obtained heart related information (e.g., Eifert, 1992; Eifert et al., 2000b).

However, some studies have failed to find content-specific biases. For example, engaging the dot-probe methodology and using social and health threat information presented at a supraliminal level (500ms), Macleod et al. (1986) demonstrated a general negative attentional bias for HTA participants when compared to those with LTA. However, when the anxious group was divided into participants who reported primarily worrying about physical health concerns and those worrying about social concerns, the two groups did not significantly differ in their response latencies to probes following physical health and social threat words. More recently, 66 non-clinical high and low anxious individuals were tested three times on the dot-probe task, under stress (before examinations and lab-induced stress) and no stress. There was no evidence for content-specific attentional biases in any of the conditions. Rather HTA individuals displayed a general bias towards threat for stimuli presented at the supraliminal level before examinations and towards the subliminally presented stimuli in the no threat condition (Mogg, et al., 1994). It has been argued that the threat concerns may not be strong enough in subclinical groups to elicit a content-specific attentional bias, however some research has failed to find content-specificity in clinical populations also (e.g., Bradley et al., 1995; Mogg et al., 1995).

For example, in one clinical population study only partial support for specificity was found. Panic and Obsessive-Compulsive Disorder (OCD) patients and normal controls response on the modified Stroop task were compared on panic specific versus other types of words (general-threat, panic-specific positive and neutral). Results indicated that although Panic but not OCD patients displayed a larger attentional bias towards panic-threat words compared to positive-threat and neutral words, partially supporting the Content-Specificity hypothesis, Panic patients did not respond differently to panic-threat words and general-threat words despite the panic words being selected because they were central to the concerns of Panic Disorder patients (McNally et al., 1994). It is also argued that the absence of content-specificity effects in some empirical studies may be in part related to the duration that the stimulus is presented.

Level of Processing and Content-Specificity

Several influential models of anxiety-related attentional bias suggest that the level of information processing influences when content-specificity will be found (Mathews et al., 1997; Mogg & Bradley, 1998; Mogg et al., 2000b). In these models, subliminal processing is related to the general classification of information as threatening or benign. Thus at the subliminal level of processing an absence or less marked specificity effects would be predicted. Although a number of studies have reported attentional bias towards threat at both levels of processing (Bar-Haim et al., 2007) this theory is supported by several studies that have found no evidence of specificity, but rather a general bias towards all classes of threatening information at the subliminal level of processing but specificity effects at the supraliminal level in HTA individuals (i.e., Asmundson et al., 1992; Bradley et al., 1995; Carter et al., 1992; MacLeod & Rutherford, 1992). Limited evidence is also provided by studies examining clinical populations, for example in a study examining Somatoform Disorder patients, a content specific bias (towards health threat) was found at the supraliminal level of processing but no attentional bias effect was found at the subliminal level of processing (Lim & Kim, 2005). Thus the possibility that the level of processing interacts with stimulus relevance must be considered when testing attentional bias patterns in HFA populations.

In summary it can be stated that to date there is no empirical research exclusively on HFA and content-specific attentional biases either in CVD or NOCP populations, but research examining other anxiety conditions theoretically similar to HFA such as Health Anxiety and Panic Disorder provides evidence to suggest a content-specific attentional bias may be present in individuals with HFA and was tested in the empirical section of this thesis. Confirmation of this has important theoretical consequences for the model of HFA because the model is built on the premise of content-specificity, which leads to content-specific attentional biases towards heart-related threatening information. The Content-Specificity hypothesis has not been examined using an objective measure of attentional bias in an HFA population.

The Emotionality Hypothesis

A large body of research indicates that anxiety-related attentional bias is triggered by the presence of threatening information and that attentional processes prioritised towards threat - the "Threat hypothesis" (e.g., Mogg & Bradley, 1998; Williams et al., 1997). In contrast, the Emotionality hypothesis proposes that individuals with clinical and HTA may selectively attend to all emotionally valenced material (Ruiz-Caballero & Bermudez, 1997). In support of this, previous research using the modified Stroop task indicates that attentional bias may be directed towards all emotionally valenced information in HTA individuals (e.g., Becker, Rinck, Magraf, & Roth, 2001; Mogg & Marden, 1990) and in clinical populations (e.g., Martin et al., 1991).

Several researchers have examined whether the source of the emotionality bias is associated with the emotionality of the words or with the extent that the words are related or semantically linked to the individual's concerns in both clinical (Mathews & Klug, 1993) and non-clinical populations (Riemann & McNally, 1995). For example, Riemann and McNally (1995) induced high state anxiety in non-clinical participants and then exposed the group to highly positive "current concern words", highly positive "non-current concern words", highly negative "current concern words" and neutral words unrelated to concern on the modified Stoop task. They found that state anxious participants were slower in naming the colours of the highly positive and negative current concern words when compared to positive words, which were not related to their concerns, or the neutral words. Both Mathews and Klug (1993) and Riemann and McNally (1995) concluded that anxious individuals show a bias for positively valenced words that are semantically related to the participants anxiety concerns. So the biases may be due to the positive words relationship with the anxiety concerns rather than the emotionality of the word in itself.

Evidence to support the Emotionality hypothesis is primarily drawn from modified Stroop-task studies, however difficulties in replicating or producing results to support the hypothesis using this task have been experienced (Ruiz-Caballero & Bermudez; 1997). This is the case for non-clinical HTA individuals, at both levels of information processing (e.g., Mogg et al., 1993a; Mogg, Kentish, & Bradley, 1993b) and with clinical populations, such as Panic Disorder (McNally, Rienman, Louro, Lukach, & Kim, 1992; McNally et al, 1994), Health Anxiety (Owens et al., 2004), GAD (Mathews et al., 1995; and PTSD (Kaspi, McNally, & Ami, 1995).

Because the modified Stroop task may not provide an unambiguous index of attentional bias (MacLeod et al., 1986; MacLeod et al., 2002), convergent evidence from the visual-probe task methodology is required to corroborate findings using the modified Stroop task. For example, a visual-probe task study examined Generalised Anxiety Disorder patients and found evidence of an attentional bias towards both threatening and positively valenced pictorial information at 1259ms, but at 500ms this effect was only seen in threatening information (Bradley, Mogg, White, Groom, & de Bono, 1999). Yet most results obtained from the visual-probe methodology have failed to support the Emotionality hypothesis in HTA individuals (e.g., Mogg et al., 1994) and clinical populations (e.g., Mogg et al., 1995). For example, Bradley et al., (1998) measured reaction times in a HTA sample to threatening, happy and neutral facial expression at 500ms. An attentional bias for negative faces, but not positive faces was found. Similarly Bradley et al. (2000) found no support of an anxiety-related bias towards happy faces, in high, medium and low anxious individuals using a dot-probe task presented at 500ms and examining eye movement to assess initial attentional focus. Bradley et al. (2000) conclude, "the pattern of bias found for happy faces was opposite to that found for negative faces, because as anxiety scores increased, the tendency to avoid happy faces increased, this provides clear evidence against the Emotionality hypothesis" (p.804). These negative results are supported by a recent electrophysiological event related potential study, which demonstrated that orientation to threatening facial expression occurs before positive faces, although the dot-probe reaction data indicated that reaction times were faster to probes replacing all emotional information than to neutral faces in a normal population. The authors concluded that the findings were consistent with the threat hypothesis of attentional bias (Holmes et al., 2009).

It can be concluded that current evidence to support the Emotionality hypothesis is limited, yet testing the validity of the Emotionality hypothesis is theoretically important, because confirmation would challenge the general models of anxiety and consequently the validity of the HFA model as it currently stands. No empirical study to date has tested the Emotionality hypothesis with individuals high in HFA and thus it is an area of interest in the empirical section of this thesis.

The Influence of State and Trait Anxiety on Attentional Bias

A number of empirical studies have examined whether attentional bias towards threat is a consequence of anxious mood (a state effect) that can vary between situations or a more enduring and stable characteristic of those prone to anxiety (a trait effect), or rather an interaction of the two. To date the empirical literature has yielded conflicting findings and has led to various proposals as to the relative roles of state and trait anxiety in attentional bias patterns. The findings have a significant relevance to the general models of anxiety (e.g., Mathews & Macintosh, 1998; Mogg et al., 2000b Williams et al., 1988, 1997) and HFA (Eifert et al., 2000b; Ratcliffe et al., 2006). This is because the general models of anxiety suggest that state anxiety is a moderating factor in the pattern of attentional bias displayed by individuals high and low in trait anxiety. The role of state and anxiety in the theoretical model of HFA (Eifert et al., 2000b) is theorised to mirror that of the general models of anxiety, but has not been empirically tested. Thus there is a need for empirical clarification in this population. A review of the empirical literature will now be conducted.

Trait Anxiety

Some research appears to provide evidence to support the dominant role of trait anxiety in producing attentional bias in clinically anxious participants (Mogg et al., 1989). For example, Mathews et al. (1990) examined currently anxious patients, recovered patients and controls who were required to disregard various types of distracters (neutral, positive, physically threatening, socially threatening) while searching for a neutral target word. The presence of any distracter, irrespective of emotional content, disrupted the performance of the currently anxious group, whereas only threat distracters slowed the recovered group. No differences were found between physical and social threat words, while state anxiety was only predictive of distraction patterns on control words. This pattern was not found in the control group. These results suggest that negative attentional bias during perceptual search is an enduring characteristic of individuals vulnerable to anxiety, rather than a consequence of current mood state alone. Several authors however, have pointed out that clinical patients commonly display elevated scores in both trait and state anxiety, and thus it is difficult to determine what is a result of separate and joint contributions of state and trait anxiety (Edwards et al., 2006; Egloff & Hock, 2001). As a result studies have routinely selected non-clinical populations and have induced state anxiety.

For example, Mogg, Mathews, Bird and Macgregor-Morris (1990) manipulated state anxiety in a non-clinical population through exposure to an unsolvable anagram task. Following this the participants performed the modified Stroop task. In this study trait anxiety was linked to performance interference, but state anxiety did not significantly influence Stroop performance. In another study Mogg et al. (1993b) used a relaxation or stress induction technique and presented information at the subliminal and supraliminal levels of information processing. Trait anxiety was associated with greater Stroop interference for subliminal threat stimuli (regardless of the induction technique). This provides evidence to suggest the dominance of trait anxiety in anxiety-related attentional bias.

State Anxiety

In contrast other research teams suggest that state anxiety may play a more important role in mediating anxiety-related attentional bias. For example, Dresler, Meriau, Heereren and van der Meer (2009) compared non-clinical participants high and low in state and trait anxiety on the modified Stroop task when exposed to negative, positive (matched for arousal) and neutral words at the supraliminal level of processing. The results indicated that state anxiety was associated with increased attentional bias. In contrast trait anxiety did not influence the attentional bias effects reported. However, it is suggested that the failure to demonstrate any trait mediated attentional biases in this study may be a result of the limited range of trait anxiety scores in the non-clinical sample employed.

Looking at a clinical population, van den Hout, Arntz, Ljansse and de Jong (1998) argue that results from psychological therapy studies which reduce clinical patients fearful concerns and reveal a reduction in threat interference on the modified Stroop task (e.g., Mathews et al., 1995) provide evidence that attentional bias results from state anxiety and is particularly convincing in studies which display a reduction in attentional bias after one session (e.g., van den Hout, Tenney, Hujgens, & de Jong, 1997). Alternatively it can be argued that these findings can be accounted for by an interaction based hypothesis, by which the bias may be a result of enduring individual differences that become apparent only when the person is primed by mood state or stressful events (Mathews et al., 1990; Mathews et al., 1995).

Indeed, empirical evidence indicates that state anxiety by itself may not be sufficient to explain anxiety-related attentional bias. For example, van den Hout et al. (1998) examined the role of state and trait anxiety in attentional biases using the modified Stoop task. Twenty-six low LTA participants who had never parachuted volunteered for a jump and their performance on the modified Stroop task was compared with a control group matched in low trait anxiety, had also never parachuted and had volunteered to jump. Elevated Pre-jump anxiety levels (state) were not related to threat-related attentional bias for parachuting or general threat stimulus words. No between-group differences were found. This experiment suggests that state anxiety by itself is insufficient to explain anxiety-related attentional biases.

The State-Trait Interaction Hypothesis

Many authors suggest that an interaction between trait and state anxiety best accounts for the results of their empirical work. Research in support of this hypothesis includes the Broadbent and Broadbent's (1988) replication of MacLeod et al.'s (1986) research with a HTA sample (n=104) using the visual-probe task. In this study attentional bias was unaffected by low to moderate levels of trait anxiety, but increased significantly at the very highest levels. State anxiety only predicted vigilance when trait anxiety was also high, suggesting an interactive effect, but only one that operates at the upper end of the distribution of trait anxiety scores.

Similarly, MacLeod and Mathews (1988) attempted to explore the effect of state and trait anxiety on attentional biases by examining a population of HTA and LTA non-clinical participants during a high and low period of state anxiety utilising the dot-probe task. As described earlier when discussing the BADA, undergraduate students were exposed to exam-related threat words, general threat words and neutral words for 500ms. High and low HTA students were tested when state anxiety was low (12 weeks before an examination) and high (1 week before an examination). Only the HTA participants showed attentional bias towards examination words, which increased as the exam approached, this can be contrasted with the LTA participants who appeared to orientate away from examination words close to the examination. In a replication of this study, MacLeod and Rutherford (1992) also found that subliminal processing and elevated levels of stress among HTA participants were related to Stroop task interference (i.e., participants directed attention towards threat), the opposite result was found for LTA individuals who displayed facilitation effects on the threat trials, indicating direction away from the threat stimulus.

More recently Egloff and Hock (2001) demonstrated similar results in a large number of non-clinical participant (n=121) using the modified Stroop task. This team reported that attentional bias scores were best accounted for by an interaction of both trait and state anxiety, in which HTA individuals attentional bias score was increased by state anxiety. The LTA showed the opposite response pattern, in which as state anxiety increases so did the tendency to attend away from the threatening information. Taken together, these studies support the hypothesis of an interaction between trait and state, such that high trait anxious participants become increasingly vigilant in stressful a situation, which increases their state anxiety level and maintains biased attentional processing and therefore anxiety. In contrast, low trait anxious participants may show an avoidant response under stress serving to restrain further anxiety increases.

Some studies have also considered the differential effect of an immediate stressor versus stress related to events likely to take place in the near future (i.e., MacLeod & Hagan, 1992; MacLeod & Rutherford, 1992). For example, Mogg et al. (1994) replicated the findings of MacLeod and Williams (1988) dot-probe study, exploring the effect of examination-based stress on attentional bias. In addition they also examined HTA and LTA individuals attentional biases following the induction of immediate stress, via a lab based insolvable anagram test and found that although the lab-based test increased state anxiety scores, the pattern of negative attentional bias found in LTA and HTA participants with the naturalistic stress (impending examination) was not present. They propose that acute stress and chronic stress may affect the pattern of biases displayed differently and should be considered when interpreting attentional allocation and state anxiety research. Edwards et al. (2006) also examined the influence of an immediate acute stressor (threat of an electric shock) on attentional bias scores in non-clinical HTA and LTA individuals. These results produced attentional bias at both subliminal and supraliminal processing levels in HFA participants only when there was a threat of electric shock. These patterns were not evident in the LTA group. These results provide evidence to suggest that if a stressor is immediate an attentional bias towards threat at both levels of processing may be found in non-clinical HTA individuals as reported in clinical populations. It is suggested the discrepancies in Mogg et al.'s (1994) and Edwards et al.'s (2003) study's may be related to the strength of the stress induction technique utilised. Nevertheless this research highlights the importance of considering the time-line of stressors on the pattern of attentional bias displayed.

In summary, the evidence indicates that individual differences in trait anxiety may generate attentional biases in interaction with state anxiety (e.g., Broadbent & Broadbent, 1988; MacLeod & Mathews, 1988; Egloff & Hock, 2001). In addition, the level of information processing and the duration of the stressor may affect the interaction effects of state and trait anxiety (Edwards et al., 2006). However, as mentioned previously a significant limitation of studies exploring state and traits role on attentional bas is that state and trait measures tend to be closely correlated, thus clarifying their effects from each other is difficult (Egloff & Hock, 2001; Mathews, 1990). Both state and trait anxiety will be considered in the following research study.

In conclusion, this chapter has reviewed the factors theorised to moderate attentional bias. The empirical data suggests that attentional bias may occur at both the subliminal and supraliminal level of processing, but does not operate identically at both levels. The role of each in HFA has not yet been empirically examined, but the literature suggests that differential patterns of bias may be seen at the two levels of processing in this population. Past research also indicates that the personal relevance of threat stimulus may affect the pattern of attentional bias (e.g., MacLeod & Rutherford, 1992). This is central to the model of HFA and although this has not been empirically validated, content-specific attentional biases are expected in HFA individuals. Further, evidence to support an attentional bias towards all emotional self-relevant information is weak. Attentional biases for all emotional information relevant to the heart is not expected in occur in HFA individuals. Finally the literature suggests that state anxiety may interact with trait anxiety in producing or increasing attentional bias patterns. State anxiety is expected to increase attentional bias scores in individuals high and low in HFA. The following chapter discusses additional attentional bias research that is specific to the current population of interest (participants with HFA either with or without CVD). The review is concluded with hypotheses to be tested in the empirical study.

Chapter 9

Attentional Bias and the Population of Interest

The current study examines individuals with and without CVD and elevated HFA. As a result this group includes health anxious, potentially organically ill, elderly individuals. This chapter considers previous research specifically exploring attentional bias in these population groups and concludes with a brief review of the effect that cognitive repression may have on the attentional bias patterns displayed by the population of interest to provide a foundation for the methodology adopted in the empirical study.

Attentional Bias, Health Anxiety and Medical Conditions

As discussed previously, there is evidence to support the presence of negative attentional bias in individuals high in health anxiety (e.g., Owens et al., 2004). Researchers have also examined health-related attentional bias in MI patients (Constans et al., 1999), however overall little work has been done on information processing in the health anxiety and the physical health area (Schwartz, Trask, & Ketterer, 1999; Williams et al., 2003). Moreover, what has been published primarily focuses on the "higher order" cognitive processes such as illness representations. Indeed, as mentioned throughout this literature review, to the author's knowledge no study to date has examined attentional bias in high HFA individuals with or without CVD. Previous work looking specifically at HFA has been based on self-report measures (e.g., Aikens et al., 1999b; Carmin et al., 2003; Ratcliffe et al., 2006), which provides only limited evidence for the presence of attentional biases towards heart related information in HFA individuals. As Moss-Morris and Petrie (2003) point out, these types of studies are subject to self-report response bias and mistakenly assume that people have ready access to information regarding their cognitive and emotional processes. Moreover, self-report measures of cognition are likely derived from conscious and controlled processes (Williams et al., 2003), however it is probable that the construct of interest in this study (content-specific heart-related illness schemas) may be more strongly derived from subliminal processes. Indeed Leventhal et al. (1997) suggest that a significant portion of the processes involved in constructing illness representations, particularly the mapping of somatic sensations to symptom labels, which is particularly relevant to HFA take place at the subliminal level of processing. Thus, it is necessary to utilise cognitive assessment techniques, which do not rely primarily on self-report. This provides a sound justification for the application of the visual-probe task to examine HFA individuals with or without CVD in the current empirical study. To further refine testable hypotheses regarding attentional bias and the specific HFA population, predictions are extrapolated from research conducted on other Health Anxiety conditions and populations with heart-related and other organic illness. This section highlights and reviews such research in the current literature.

Health Anxiety

As noted, HFA is proposed to be consistent with existing Cognitive–behavioural models of Health Anxiety (Barsky, 2001; Eifert et al., 2000b; Ratcliffe et al., 2006), in which a perceptual sensitivity to information regarding the body, particularly internal somatic information maintains the condition (Eifert et al., 2000b; Warwick & Salkovskis, 1990). Thus evidence of attentional bias in health anxiety populations can be used in developing predictions regarding the HFA patient's attentional bias patterns.

In support of an attentional bias towards body related information, research has found that those with Hypochondriacal tendencies were faster to correctly recognise illness words relative to neutral words in threatening sentences (Hitchcock & Mathews, 1992). As discussed earlier results from the dot-probe and modified Stroop tasks have also provided evidence to suggest individuals high in Health Anxiety display a Content-Specific negative attentional bias towards threat information regarding their body and illness (Lim & Kim, 2005; Owens et al., 2004). Nonetheless these results are not found consistently (e.g., Lees et al., 2005). The conflicting results may reflect differing levels of illness schema activation in the participants of the two studies' leading to non-significant results at low levels of activation as suggested by Lecci and Cohen's (2002, 2007) research. Yet this seems unlikely because the participants' state anxiety scores were similar in both studies.

Nevertheless, the issue of illness schema activation is key to the model of HFA. This is because Leventhal et al's (1997) model of illness representation suggests that when an individual is presented with information about an illness, a schema reflecting the person's idiosyncratic representation of the illness is activated automatically and this then contributes to consequent emotional responding (anxiety) and information processing (attentional bias patterns). Williams et al. (2003) provide evidence to suggest that illness schema activation may affect attentional processes in non-clinical populations. Their research involved participants writing about their last illness experiences (to prime illness schema activation), following which the participants completed the modified Stroop task and a content-specific attentional bias (illness versus non-illness words) was found for participants who rated themselves as having poor levels of general physical health when compared with those who rated themselves with higher levels of health. These results indicate that individual illness schemas may affect attentional bias patterns and that activation of illness schemas may be necessary to elicit attentional bias in people concerned about their physical health.

To further explore if direct activation/priming of an illness schema was necessary to elicit negative attentional bias pattern, Lecci and Cohen (2002) examined the effect of activating illness concerns in participants with Hypochondriacal tendencies (defined as an understanding of oneself as particularly susceptible to health threats) in two studies employing the modified Stroop task. This group induced illness-concern through a brief medical examination. The results revealed an attentional bias for health-threat related words presented at 500ms in individuals with hypochondriacal tendencies but only when illness-concerns were induced. This finding suggests that illness schema activation and therefore elevated state anxiety regarding health may play a significant role in the demonstration of an attentional bias in non-clinical hypochondriacal participants. More Recently Lecci and Cohen (2007) explored this issue using similar methodology, but additionally manipulated perceived control. They once again found that activation of health threat schemas in individuals with Hypochondriacal tendencies was necessary to increased interference on the modified Stroop task. In addition, the researchers found that attentional bias was significantly higher in individuals with perceived low control over the health threat. This research provides direct evidence that one aspect of illness representation (perceived control) directly affects attentional processes and provides evidence for the application of cognitive illness representation models to HFA and the study of negative attentional bias.

Lecci and Cohen (2002, 2007) go on to suggest that these findings are clinically significant because health-seeking behaviour (seeing doctors etc) commonly displayed by this population may be the means through which health schemas are activated, and perceptual bias are triggered. However, as with much of the research completed with non-clinical populations, it was primarily made up of young, healthy university students. Caution must be made when making assumptions about the elderly sample utilised in the current research. Finally, this research is also in keeping with the literature suggesting that state anxiety may contribute to the strength of attentional biases in HTA individuals (e.g., Egloff & Hock, 2001). Hence the current study measured state anxiety levels. It was not however in the scope of this study to seek to prime illness schema or induced high anxiety in participants. However, if attentional bias patterns were found a tentative comment regarding whether active priming is necessary to elicit attention bias patterns in high HFA individuals with and without CVD could be made.

Research has also examined whether individuals with Health Anxiety selectively attend to internal body sensations. Brown, Poliakoff and Kirkman (2007) developed a novel dot-probe task, to test this. Forty-eight non-clinical participants assessed for Somatoform symptoms and somatic amplification were exposed to body relevant and body irrelevant pictures, half of which were threatening and half neutral. Participants then judged whether a visual (light) or tactile target (vibration on thumb) was presented on the left or right side. The reaction times towards tactile and visual targets were then compared to provide information regarding attention towards the two modalities. The results indicated that individuals with Somatoform symptoms attended more to tactile stimuli immediately following exposure to threatening body information. This bias was evident at 250ms but not at 500ms. This suggests that visual stimulus has an instant effect on attention towards the body opposed to other aspects of the environment, but at longer exposures individuals may utilise strategic avoidance to counteract this tendency. This study provides evidence in conjunction with other research to suggest that those with unfounded fear regarding illness may preferentially attend to their body, particularly in the early stages of information processing. Further it provides evidence of a vigilance-avoidance pattern of attentional bias in non-clinical somatically concerned individuals.

Conversely, other research has failed to replicate the presence of heightened awareness for interoceptive stimulus in Health Anxious individuals. For example, Barsky et al. (1998) found that although one third of heart transplant recipients were accurately aware of their resting heartbeat, sub-clinical Hypochondria did not predict this awareness. Research outcomes that have examined whether physically healthy Panic Disorder patients heartbeat detection is more accurate than other groups have also been mixed (See van der Does, Antony, Ehlers, & Barsky, 2000 for a review). Van der Does et al. (2000) argue that based on empirical data, the critical factor in Panic Disorder patients is the triggering of negative schemas related to body sensations and the interpretation of heart sensations as threatening, rather than the increased ability to accurately detect heart rate per se that causes psychological dysfunction. For example, Pauli et al. (1991) using a 24-hour ambulatory ECG found that Panic Disorder participants and controls did not differ in the incidence of cardiac perception reported, but healthy controls showed a decrease in heart rate following perception, versus those with Panic Disorder who showed an increase in heart rate. The heart rate increase following cardiac perception was positively related to the level of anxiety elicited by those perceptions.

Taken as a whole the evidence regarding the preferential processing of health information seems to provide some support for a negative attentional bias towards health related information in Health Anxious individuals, particularly when illness schemas are deliberately primed prior to performance of the attentional assessment task. Furthermore, it would seem that Health Anxious individuals also pay preferential attention specifically to internal bodily symptoms, particularly at the subliminal level of processing, although the accuracy regarding stimulus perception may not be as important as the manner in which these sensations are interpreted (i.e., the role of illness schema).

Medical Conditions

Fortune et al. (2003) comment that there is limited research into cognitive processing in patients with organic disease, but this area is important to the current study because it provides insight into how having a physical illness (with or without co-occurring psychopathology) may affect information processing. Several studies have examined attentional bias in individuals with specific medical conditions and although there is evidence to support the presence of a negative attentional bias towards illness specific information in chronically ill patients, particularly in chronic pain (e.g., Snider, Asmundson & Wiese, 2000), the results to date remain inconclusive.

Specific to CVD, Constans et al. (1999) examined whether attentional bias to cardiac related words was present in participants who had experienced a MI within the last six months. This study enlisted post-MI participants (n =33) and matched controls (n=31) with no history of CVD and tested them on a variation of the dot-probe task at an exposure time of 500ms. The results indicated that despite the post-MI group having higher levels of heart-related worry and emotional distress when compared to the control group, post-MI patients did not show an attentional bias towards cardiac-threat information presented at 500ms. However, subsequent analysis of their data found that a self-reported tendency to monitor threat information was associated with attentional bias towards cardiac-related words in patients with heart disease. This is relevant to HFA because self-reported high vigilance to cardiac information is one of the three sub-scales of the Cardiac Anxiety Questionnaire (CAQ, Eifert et al., 2000a) used to diagnose HFA. It is therefore suggested that this factor may be highly related to the display of a negative attentional bias towards heart-related stimuli. Interestingly in the control group, individuals reporting high level of heart-related worry tended to avoid, rather than attend to, cardiac information, providing some support for selective attentional processes in individuals with no illness but heart-related worry. The authors suggest that this finding is indicative of the application of strategic avoidance in order to manage uncomfortable emotionality. This finding is in line with previously reported results in non-clinical populations exposed to self-relevant information at a supraliminal processing level (i.e., MacLeod & Rutherford, 1992; Mogg & Bradley, 2004; Mogg et al., 2006). To explain the lack of an attentional bias for the post-MI participants, the authors suggest that CVD patients with no evidence of clinical anxiety may display different attentional processing strategies than those with clinical levels of anxiety. Further, they suggest that when the threat becomes more severe (i.e., for post-MI participants) but coping mechanisms remain intact (they are not overwhelmed by anxiety) that the individuals may not be able to use avoidance (as seen with the non

CVD but heart concerned group), but attention is not automatically drawn to the information either. Other researchers such as Mogg & Bradley (2006) support this explanation, because they report an attentional bias pattern only in the shorter exposure condition but not at the longer ones (i.e., 500ms). It would be important to consider the subliminal level of processing in further studies with low anxious CVD patients to determine if an attentional bias toward threat is occurring at earlier stages of information processing. Likewise a comparison between individuals with and without CVD, high and low in HFA at both levels of information processing would extend these results.

In a related area, Livermore, Sharpe and McKenzie (2007), explored if older adult participants with Chronic Obstructive Pulmonary Disease (COPD) with or without a history of panic attacks or Panic Disorder and healthy controls displayed attentional biases towards physical threat, physical positive and neutral words presented using the dot-probe task at 500ms. Interestingly, the results revealed that individuals with COPD and panic did not attend to threat words, but rather showed a bias towards positive words, which was influenced by the patient's depression score (the bias towards positive words was not significant when depression was controlled for). COPD patients without panic and healthy controls demonstrated an attentional bias towards threatening information. The authors suggest that attention towards positive physical words may be a coping mechanism employed by older individuals with chronic illness. A body of empirical research completed with elderly participants supports this explanation (See Leventhal & Crouch, 1997 for a review). This however does not explain why the COPD non-panic group did not also attend to the positive information. This research indicated that self-relevant information in non-anxious chronically ill patients may lead to preferential processing of threat information – potentially as an adaptive measure in managing the illness condition as suggested by several authors (Cioffi, 1991; Livermore et al., 2007). This does not explain why the healthy controls also attended to the information. Based on Leventhal and Crouch's (1997) research, it is possible that because health related information is more self-relevant as an individual age that it becomes more attended to. It is clear that further empirical research with chronic illness and the elderly is required to determine if processing priorities are different to that observed in younger populations with health concerns as suggested by Leventhal and Crouch (1997). There is a scarcity of research addressing this issue in CVD to date. Thus in the current study, age was measured as a covariate.

Recently Hou, Moss-Morris, Bradley, Peveler and Mogg (2008) examined for the presence of a content-specific attentional bias in Chronic Fatigue Syndrome using a pictorial and linguistic version of the dot-probe task. This study found an attentional bias towards both pictorial and linguistic health-threat stimuli in this group, which was not evident in the healthy control group. These results were not affected by anxiety and depression measures. These results are similar to Fortune et al. (2003) who examined attentional biases for psoriasis and social threat words in psoriasis patients. They found that patients with psoriasis (n=60) showed significant interference for disease-specific stimuli relative to matched controls on the modified Stroop task. The relationship between participant status (psoriasis/control) and colour naming interference was stronger than that between state or trait anxiety, depression and worry. They conclude that the observed bias was more appropriately accounted for by participant status than by psychological status.

Together these findings provide evidence to support the current study's hypothesis regarding CVD patients with low HFA. It was predicted that CVD participants with low HFA would demonstrate a negative attentional bias towards heart-related information (due to personal relevance and as a functional information gathering mechanisms regarding their illness). However, the findings lead one to question the role of anxiety in chronic illness, given that anxiety was not strongly related to the attentional bias scores in the studies. It is suggested that because most of the groups were not selected based on psychopathology that the true effect of elevated anxiety on attentional bias in a chronically illness population was not examined. Further, the direct application of this research to a CVD population is tentative, because Psoriasis and Chronic Fatigue Syndrome are not potentially life threatening illnesses, and as such may be associated with a different type of cognitive and emotional illness representation than CVD (i.e., on the consequence dimension or level of concern, Leventhal et al., 1997). Because the type of illness representation held by a patient is theoretically linked to the type of attentional processes exhibited (Leventhal et al., 1997), different patterns of attentional bias may be found in CVD patients low and high in HFA. Empirical clarification of this issue is required.

Adding to the complexity in clarifying attentional processing exhibited in chronic illness patients are results that suggest that state anxiety, rather than illness status best accounts for the patterns of negative attentional bias displayed towards illness specific stimuli at the conscious level of processing (e.g., Snider et al., 2000). Furthermore, some research has failed to find any attentional bias all. For example, Moss-Morris and Petrie (2003) in contrast with Hou et al., (2008) found that Chronic Fatigue (CFS) patients did not show attentional bias for somatic information utilising the modified

Stoop task, despite higher levels of anxiety and depression when compared to healthy controls. Moss-Morris and Petrie (2003) suggest that there may be mediating factors, which produces attentional bias patterns in illness conditions, such as fear (i.e., the fear of effort in CFS). This hypothesis has been experimentally validated in chronic pain patients, in which a fear of pain led to a significant attentional bias towards threat words on the dot-probe task compared to pain patients without a fear of pain (Asmundson & Hadjistavropoulos, 2007). This finding may be relevant to CVD patients with elevated HFA, in which a fear of cardiac-related pain may result in negative attentional bias patterns being displayed (Eifert, 1992). It is also possible that the lack of attentional bias reported in some studies with chronically ill populations is because the patients' illness schema was not primed prior to completing the attentional measurement task, as seen in research with participants high in health anxiety and no physical illness (e.g., Lecci & Cohen, 2002, 2007) and in general anxiety conditions (e.g., Egloff & Hock, 2001; MacLeod & Rutherford, 1992).

In summary, although there is evidence to support the presence of an attentional bias in chronically ill individuals, the findings suggest that the effect may be mediated by other factors. The findings suggest that attentional bias patterns in CVD patients are potentially different in individuals with or without psychopathology (i.e., Constans et al., 1999), however this requires empirical validation. Further other factors, for example the participants' age may also have a hand in the attentional bias patterns displayed (Leventhal & Crouch, 1997; Livermore et al., 2007). Thus, the current empirical study considered age as potential covariate in analysis. It is also important to consider if age may affect the validity of the use of the visual-probe task in the measurement of attentional bias. This issue will now be considered.

Attentional Bias and the Elderly

As reviewed earlier, CVD is the most common health problem in the elderly and its prevalence increases progressively with age (Australian Heart Foundation, 2008; Fauci et al., 2007). The following study's experimental group were therefore likely to be elderly. The literature regarding changes in attention in the elderly documents age-related difficulties in the ability to ignore non-task relevant information, divide attention and maintain vigilance or sustain attention over a long period of time (Fox & Knight, 2005). Thus it was important to ensure that the visual-probe task would be appropriate to use as a measure of attentional bias in an elderly population.

Although the presence of attentional bias in adults is well established (Bar-Haim et al., 2007), only one study to date has examined if this phenomena is reliably present in older adults on the modified Stroop and dot-probe task (Fox & Knight, 2005). Given the documented age-related changes in attention, it is appropriate to verify that the paradigm is appropriate for use with older adults. To examine this, Fox and Knight utilised a mood induction technique with 68 healthy adults, aged 60+, who were randomly assigned to a neutral or anxious mood induction group. The groups then completed the modified Stroop and dot-probe tasks (stimulus words presented at 500ms). The results indicated that older adults induced with elevated state anxiety demonstrated an attentional bias towards threat on the dot-probe task, independent of trait anxiety. The results did not confirm that high trait anxiety is necessary to trigger attentional bias. The authors report that the attentional bias scores found in this study are similar to those found with younger adults. The results provide justification for employing the dot-probe task to assess attentional biases in an older population.

Repression and Attentional Bias

It has been found that results utilising the dot-probe task to identity attentional bias in high and low anxious individuals maybe be confounded unless a third factor, repression, is taken into consideration (Eysenck, 1997). This is particularly relevant to this empirical study because a high percentage of repressors have been recorded in the elderly population; research indicates that up to 50 per cent of the elderly may adopt a repressive coping style (Erskine et al., 2007). Furthermore, there is also a high percentage of repressors in individuals with chronic illness; research estimates prevalence rates to be between 30 to 50 percent (Ayers & Myers, 2008; Cooke, Myers, & Deakshan, 2003). Therefore controlling for repression in the current study seems particularly relevant.

A repressive coping style is characterised by a tendency to avoid processing negative information to avoid negative affect (Ayers & Myers, 2008; Eysenck, 1997), however although repressors report less anxiety, research indicates they behave physiologically and behaviourally as if more anxious than highly anxious individuals (Weinberger, 1990). Operationally, a low score on self-reported anxiety, but a high score in defensiveness, (typically measured by the Marlowe-Crowne Social Desirability Scale; Crowne & Marlowe, 1960) defines a repressive coping style. There are three other types of coping outlined in this typology. These are true low anxious (low anxiety and low defensiveness), and two high types, those who are high anxious (high anxiety and low defensiveness) and defensive (high in anxiety and high in defensiveness) (Weinberger, 1990).

Although the results are inconsistent, high levels of repression have confounded effects on measures of self-reported anxiety (Furnham & Traynar, 1999) and attentional bias (Eysenck, 1997; Mogg et al., 2000a). Studies utilising the dot-probe task and modified Stroop task have shown that differing responses occur within the low anxiety subgroup, true low anxious participants appearing unaffected by the nature of the stimuli (i.e., do not display preferential processing to threatening information) while repressors tend to shift attention away from emotionally threatening material (Mogg et al., 2000a). In another study by Jansson, Lundh and Oldenburg (2005) all subgroups except the repressors showed Stroop interference for threat words. The repressor group did not show any attentional bias either way to threat stimulus – suggestive of a defensive response. However some research has failed to find that repression influences the attentional bias patterns displayed, for example, a more recent Stoop task study found that a repressive coping style did not affect the pattern of attentional bias displayed in a low anxious group for subliminally presented words (Jansson & Lundh, 2006). However, overall the empirical literature indicates that repression affects the attentional bias patterns displayed and as a result repression was controlled for in the present empirical study to ensure that it does not confound the obtained attentional bias results.

This chapter has reviewed the empirical literature on attentional bias and the current studies particular population of interest. Based on this review it would seem that individuals high in health anxiety without a verified organic illness are likely to display a content specific attentional bias. Furthermore individuals with an organic illness may display an attentional bias toward illness congruent information, but some research suggests that this population may attend preferentially to positive information in an attempt to manage uncomfortable emotional reactions and this may increase with age.

Finally it would seem that a repressive coping style might affect the pattern of attentional bias exhibited in the sub-group of self-reported low anxious individuals. Thus this must be controlled when examining attentional bias in HFA populations. The concluding chapter of this literature review summarises the main theoretical arguments of the project and presents the experimental hypotheses that were tested in the empirical research study.

Chapter 10

Summary and Experimental Hypotheses

There is accumulating evidence indicating that individuals with high anxiety regarding their hearts' health have negative and dysfunctional schemas about the heart (e.g., Eifert et al., 1996) that can lead to negative information processing biases and poor biopsychosocial outcomes for individuals with or without an organic cardiovascular disease (e.g., Barsky, 2001). These poor outcomes demand improved understanding of the mechanisms that aid in their creation so to develop more effective intervention and treatment. However, to date much of the research on heart-related anxiety has been based on self-report measures, so there is a need to extend this evidence utilising experimental methodologies that focus on aspects of psychological processes not readily captured by self-report techniques. This study extends these findings to ascertain whether negative illness schemas regarding the heart's health affect the way in which individuals with or without CVD, high or low in HFA process information regarding heart-related stimuli on the visual-probe task.

The present empirical study's hypotheses are based on the following empirical findings; 1) persons with clinical anxiety or HTA display an attentional bias toward stimuli congruent with their specific fears (e.g., Brown et al., 2007; Carter et al., 1992; Owens et al., 2004). This is central to the theoretical model of HFA (Eifert et al., 2000b; Ratcliffe et al., 2006), so the Content-Specificity hypothesis was examined. Further, 2) a body of research in accordance with the CMV (Mogg et al., 2000b) indicates that the level of stimulus threat intensity affects the pattern of bias seen in high and low anxious individuals (e.g., Koster et al., 2006a, Mogg et al., 2000b). Clarification of the role of threat value in high and low HFA participants with or without CVD was needed to further understand the underlying mechanisms in the HFA model. 3) A large proportion of literature and current theory suggest that anxiety-related conditions might be related mainly to subliminal processing (Mathews, 1990). However Eifert et al.'s (2000b) model suggests that HFA may be associated with attentional bias towards cardiac-related information at both levels of processing. Further, some research suggests that Content-Specificity is seen predominately at the supraliminal level of processing (e.g., Bradley et al., 1995). Due to the ambiguous nature of the current literature, the study examined the role of subliminal and supraliminal information processing in HFA. Additionally, 4) some studies suggest that the attentional bias observed in anxious persons may be directed towards all emotionally valenced information (the Emotionality hypothesis; Martin et al., 1991). This has implications for the theoretical model of HFA given that the existence of a negative attentional bias is central to the model, so the Emotionality hypothesis was examined. Finally, 5) a number of studies have examined whether attentional bias towards threat is a consequence of state anxiety, trait anxiety or a complex interaction of the two. The empirical literature has yielded conflicting findings, but it seems likely that an interaction of both produces the attentional biases reported in the research (Mathews, 1990). The role of state anxiety in HFA was therefore considered.

The data derived from the five areas outlined are used to draw conclusions regarding the relationship between attentional bias and HFA in patients with or without CVD. The main hypotheses are presented in the next section of this chapter and provide information regarding the mechanisms leading to the development and maintenance of

HFA, based on Eifert et al.'s (2000b) model of HFA. Clarification and validation of the HFA model may aid in the accurate and early diagnosis of HFA patients either with or without organic illness, and may contribute to the development of evidence-based clinical treatments, helping individuals break the self-perpetuating cycle associated with HFA. An application of this information should theoretically lead to decreases in functional impairment, increases in quality of life, and reduced health care costs associated with individuals high in HFA either with or without CVD.

The Experimental Hypotheses

1. The Content-Specificity Hypothesis

Hypothesis 1.1. High HFA participants, either with or without CVD, will display a significant attentional bias toward Heart-High Threat information when compared to other emotionally valenced stimuli. Conversely low HFA participants without CVD (healthy controls) will direct attention away from Heart-High Threat information. High Trait anxious individuals will display a significant attentional bias towards all high threat stimuli.

Hypothesis 1.2. Individuals with CVD and low HFA will display an attentional bias towards Heart-Threat (High and Moderate) related words but not Social-High Threat or Disaster-High Threat words (due to familiarity/relevance), from which they will attend away.

Hypothesis 1.3. Non-CVD individuals high in HFA anxiety will display a greater attentional bias toward heart-related stimulus words than to other word types when compared with non-CVD individuals high in Trait anxiety (low HFA).

Hypothesis 1.4. CVD participants with high HFA will display a larger negative attentional bias to Heart-High Threat words than non-CVD participants with high HFA.

2. The Role of Stimulus Threat Level

Hypothesis 2.1. Individuals high in HFA with CVD will display an attentional bias towards both high and moderately threatening heart-related information compared to those with low HFA and CVD who will display an attentional bias towards Heart-High Threat but not moderately threatening heart information (in accordance with the CMV, Mogg et al., 2000b).

3. The Role of Processing Level

Hypothesis 3.1. A specific attentional bias towards Heart-High Threat related words will be found in high HFA participants at both the subliminal and supraliminal level of processing (i.e., a vigilance-avoidance pattern will not be found in this population as proposed by Eifert et al., 2000b in their model of HFA).
Hypothesis 3.2. That the negative attentional bias patterns demonstrated towards Heart-High Threat information by high HFA participants will be significantly greater in the subliminal processing task than the supraliminal processing version of the same task (in accordance with BADA and CMV).

4. The Emotionality Hypothesis

Hypothesis 4.1. Individuals high in HFA will not selectively attend to all emotionally valenced material related to the heart. The attentional bias will be found for heart-related words of a high and moderate threatening nature only (The Threat hypothesis).

5. The Role of State Anxiety

Hypothesis 5.1. Those high HFA individuals who are also high in state anxiety will display significantly larger negative attentional bias patterns towards cardiac-related stimuli when compared to high HFA participants low in state anxiety (an interaction between state anxiety and HFA will be found).

Hypothesis 5.2. That individuals low in HFA with high state anxiety will display a greater attentional bias towards high threatening cardiac-related words compared to those individuals with CVD low in HFA with low state anxiety (in accordance with CMV), which will be more evident at the subliminal level of processing compared to supraliminal.

Minor Hypotheses

6. The Role of Repression

Hypothesis 6.1. That individuals categorised high in repression would display a significantly greater attentional bias away from threatening information than the true low anxious participants who do not score high in repression.

7. The Role of Age

Hypothesis 7.1. Age will moderate the strength of attentional bias in HFA participants. Younger age will be linked to increased strength of the attentional bias pattern seen. (Research shows that older people begin to selectively attend to positive information as a protective measure as they age).

Chapter 11

Method

Participants

A total of 178 adult participants of both sexes were recruited mainly from local medical centres, hospitals and community groups via a written advertisement and a series of public information sessions. Additionally, a small number of the 178 volunteers were recruited by means of a "snowball" technique. The participants were then contacted by telephone and provided with a pre-laboratory testing kit.

Participants ranged from 42 to 89 years old (M = 64.52, SD = 12.93). The sample included 79 females and 99 males representing a predominately Caucasian population (98.3% Caucasian, 1.12% Asian, and 0.56% African American). A total of 79 individuals with CVD as diagnosed by a medical practitioner and 99 individuals without CVD participated in the study.

Because the procedure involved reading briefly presented English words, any participant whose first language was not English or who scored less than 15 on the second edition of the National Adult Reading Test (NART-2, Nelson & Willison, 1991) was to be excluded from the study. No participants met this exclusion criterion, nor were any participants excluded due to cognitive impairment or medical conditions/medications that could impact on cognitive functioning.

Participants were also assessed during the sessions for awareness of the content of the subliminal stimuli; one participant was excluded as a consequence. Participants' data was also removed from the study following the laboratory session if they performed at an error rate of 10% or above on the visual probe task, leaving a total of 149 participants (males 89, females 60). All experimental group information below is based on the data set from the remaining participants (see results section for further information on the percentage of participants removed). No monetary compensation was provided for participation.

Measures and Apparatus

Questionnaires and forms

Prior to the laboratory session all participants were sent a pre-laboratory testing packet. Each participant completed a Participant Information Questionnaire to record age, sex, whether English was his or her first language, illness status, and medication use. Participants also completed a Release of Information Form, by which written permission for the researchers to source limited information regarding the participants' heart disease from their treating practitioners was obtained and used to confirm eligibility and medical clearance for participation. A Doctor's Record on Participant and Eligibility to Participate Sheet was used to obtain written confirmation from the treating practitioner that the patient was fit to participate in the study and an indication of the individual's diagnosis, severity of illness and length since the CVD diagnosis was made.

To measure HFA, each participant also completed the Cardiac Anxiety Questionnaire (CAQ, Eifert et al., 2000a). This standardised 18-item questionnaire requires that participants' rate how frequently certain behaviours occur, the responses ranging from never (0) to always (4). The CAQ provides a total score and three subscale scores pertaining to fear and worry about chest pain and sensations, avoidance of activities believed to induce cardiac symptoms and heart focused attention and monitoring of cardiac symptoms. The CAQ is used to assess HFA with an adult population and has reported sound psychometric properties (Eifert et al., 2001). The CAQ is internally consistent and has demonstrated evidence of convergent validity (see Eifert et al., 2000a for a more detailed description of the psychometric properties of the CAQ). The total HFA score is computed as the mean of the relative frequency rating for each of the18-items (subscales are scored similarly).

To measure state and trait anxiety, both forms of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983) were completed. This is a widely used participant-completed questionnaire composed of two scales: 20 items measuring state anxiety and 20 items measuring trait anxiety. The STAI is a pure measure of anxiety and allows differentiation between situational and trait anxiety. The scale has good internal consistency, convergent validity, and test-retest reliability with older adults (Spielberger et al., 1983) and has been frequently utilised in empirical health related research examining older adults (e.g., Narita et al., 2008) including cardiac disease (Frasure-Smith & Lesperance, 2003; De Jong & Hall, 2006). In the current study high State anxiety was considered to be a score 40 or greater, and normal to low State anxiety was considered to be a score 39 or below. The allocation of high and low trait anxiety labels is discussed under the subsection of preliminary analysis in the results section.

The Marlowe-Crowne Social Desirability Scale (M-C SDS, Crowne & Marlowe, 1964) was used to assess defensiveness and protection of self-esteem. This is a 33-item measure of defensiveness with high scores indicating greater defensiveness. This scale uses a true/false format. The scale was used in combination with the trait anxiety section of the STAI to assess participants on their coping style and particularly for repression (Weinberger, 1990). Which was included because a repressive coping style may be a confounding variable affecting the validity of self-report measures of anxiety, such as the STAI (Eysenck, 1997; Furnham & Traybar 1999; Mogg et al., 2000a). In addition, research indicates that a repressive coping style may affect the pattern of attentional bias exhibited by participants (Eysenck, 1997; Jansson et al., 2005; Mogg et al, 2000a). The use of the M-C SDS and STAI-T as a measure of repression is well established (Mogg et al., 2000a) and is valid and reliable in the assessment of an elderly population (Erskine et al., 2007).

An "In Session Questionnaire" was also used to gain additional information regarding potential medical and social confounding factors, such as if the participant has a history of stroke or damage to the brain, visual impairment or a family history of CVD.

Visual Analogue Scales for low mood and anxiety were used at three points throughout the laboratory session to investigate whether the experimental groups differed in subjectively reported anxious and low mood state. One scale displayed the terminal labels *not at all anxious to extremely anxious* and the second *not at all* un*happy to extremely unhappy* on a ten-point scale. Copies of all questionnaires and forms are presented in Appendix A.

Assessments

The NART-2 (Nelson, & Willison, 1991) was used to measure and control for participants' reading ability and verbal intelligence. This measure was chosen because of its high reliability and validity (Spreen & Strauss, 1998) and further because it has been tested and designed for use with an elderly population (Nelson & Willison, 1991). In this task, participants are asked to read aloud a list of fifty irregularly spelt words presented in a booklet form (one word per page) in order of increasing difficulty. Because the words presented do not follow the regular rules of English pronunciation, reading relies heavily on word recognition rather than phonemic translation. Responses were scored as correct if pronunciation was accurate, and a total score was computed. The NART is a widely used tool and a validated test in laboratory based research (Spreen & Strauss, 1998). Participants were to be excluded if they scored less than 15 on the NART-2.

The Visual-Probe Task

All stimuli were presented using an Acer computer running Windows 2000 and a 21-inch computer screen. The visual-probe task utilised was a modified version of MacLeod et al.'s (1986) dot-probe task, but using an arrow probe that appeared after every trial rather than on randomly selected trials. Each trial commenced with a 1000-ms presentation of a 5mm cross in the centre of the monitor, providing a fixation point and cue for participants. At the termination of this cue, a word pair was presented in white upper-case letters in 14-point font (Times New Roman). One word was presented above and the other below the preceding cross, separated vertically by a distance of 3cm (visual angle, less than 2 degrees). The positions of the words were randomised so that the probability of any word appearing either in the upper or lower location was equal (cf., MacLeod & Mathews, 1988). The exposure duration of the words was designed to assess subliminal and supraliminal processing as recommended in past research (e.g., Cisler et al., 2007; Mogg et al., 1997). In the subliminal condition presentation times were adjusted individually for each participant (cf., Edwards et al., 2006) and in the supraliminal condition the words were presented for 1000ms. After the offset of the words, a 24-point arrow appeared, replacing one of the words in either the upper or lower position. The arrow appeared 25ms after the word presentation and remained until either the participant responded indicating whether the arrow had pointed to the left or right, or else a response time-out of 1000ms occurred. Response latencies were automatically recorded for the four possible combinations of probe and target word positions. The delay between word pair sets was 2500 milliseconds as recommended by Fox and Knight (2005) when testing with an older participant pool for all trials. The luminance of the background and text remained constant throughout trials.

Subliminal and supraliminal presentations were run as two separate blocks and each consisted of 260 word pairs (each target word and its neutral pair were presented twice, and neutral-neutral pairs were presented once each in the two trials).

Stimulus words

The stimuli used in the present investigation comprised seven categories of words (see Appendix B) 1) 20 Heart-High Threat, 2) 20 Heart-Moderate Threat, 3) 20 Heart-High Positive, 4) 20 Social-High Positive, 5) 20 Social-High Threat, 6) 20 Disaster-High Threat and 7) 160 neutral words. Each word in the first six categories was paired with a neutral word matched for word frequency use in the English language and word length using the MRC Psycholinguistic database (Coltheart, 1981). A further neutral-neutral set of 20 word pairs was created which also served as a control to ensure that the apparatus was functioning properly (evidenced by an attentional bias index score close to zero for this set). Like the target words, all neutral words were from a specific semantic domain and matched for frequency and length using the MRC Psycholinguistic database (Coltheart, 1981).

The stimulus words were developed based on focus-group interview data and input from a clinical psychologist experienced in treating patients with health anxiety conditions, in addition to words utilised in previous dot-probe research on CVD (i.e., Constans et al., 1999) and HTA (e.g., MacLeod & Rutherford 1992). From this process, 200 potential words were developed. A final list of 120 words was selected by asking 20 individuals with CVD and 20 without CVD to rate the emotional valence of 200 potential positive and negative words falling into the categories of heart disease, social stimulus and disaster. See Appendix C for further discussion of the selection and development of the Heart-High Positive stimuli. Each of the 200-candidate words was presented in a random order and the valence of each potential word was rated on a ten-point visual analogue scale (ranging from 1 = extremely threatening, defined as how emotionally uncomfortable the words made the reader and 10 = extremely positive, defined as how pleasant the word made the reader feel). A mean valence score for each of the six stimulus categories (e.g., Heart-High Threat) was computed. Words with a mean valence rating of three or below were selected as highly threatening stimuli and heart-related words with a mean score between three and half and five were selected as moderately threatening heart words. Those words with a mean of eight and above were adopted as highly positive stimulus words. The final list contained an equal number of hyphenated words in each category. Appendix D provides mean valence ratings for the selected 120 experimental words and statistical analysis on group valence ratings. This was completed to ensure that each category was indeed what it was it was intended to be and that the negative categories did not differ significantly in valence rating or between CVD and non-CVD participants. This was also completed for the positive groups of stimulus words.

Target words and their neutral pairs were presented twice providing 40 pairs in each of the six stimulus categories and neutral-neutral pairs were displayed only once. The same word pairings were used for both subliminal and supraliminal trials. The order of the stimulus presentation was randomised for each trial and participant.

Practice and Awareness Check Word Pairs

A practice list consisting of 12-paired neutral words was used to orient participants to the experiment and to control for any difficulties in comprehension of the task. A second set of neutral words (six sets of five pairs) was also employed and sourced from past experimental work using the dot-probe task. This stimulus set was used to adjust individual presentation times for participants prior to completing the subliminal presentation set and to test for conscious awareness of words following the completion of the subliminal task. The Practice and Awareness Check Word Pairs can be seen in Appendix E.

Procedure

Participants were tested individually in a small, consistently well-lit office cleared of distracting material. Participants were informed that the study was being conducted in order to examine how different individuals pay attention to words that may be relevant to them based on their health status and other personality factors. An information sheet regarding the purpose of the experiment was provided to all participants both with the initial mail-out and at the laboratory session. At this time written and informed consent to participate in the laboratory session was gained and any additional questions regarding the study were answered. The two forms can be viewed in Appendix F.

Participants then completed the state version of the STAI (Spielberger et al., 1983) and the "In Session Questionnaire". Following these participants were seated in front of an Acer desktop computer as described above at a distance of approximately 60cm from the screen and given the following instructions.

" During the experiment you will be asked to start each response by focusing on a fixation point in the shape of a cross located on the computer screen. Following this you will be presented with two words, which will appear on the screen – one above and one below the fixation point. Sometimes these words will be shown only briefly and you may not be able to read them or recognise them as words and sometimes they will be shown for a longer period, where you will be able to read them. The main part of the task is to identify whether the arrow that will appear after the word pair disappears is pointing to the left or the right hand side. If the arrow is pointing towards the left, press the left arrow key, if the arrow is pointing towards the right, press the right arrow key. It is very important that you work as quickly as you can but without making any mistakes. Accuracy is very important. It is also very important that you attend to the words as they appear on the screen, as you will be given a test related to the words to complete at the end of the task. You will also be asked to complete several mood scales throughout your computer task – I will instruct you when to complete these. The two scales you will be asked to complete will be made up of a straight line. At one end of the scale will be the label *not at all anxious and,* at the other end, *extremely anxious.* The second scale will have *not at all unhappy* to *extremely unhappy,* you will be required to indicate your current mood state by circling a number from one to ten that best describes how you feel at the exact time that you are asked to complete the scales (participant shown scales). Do you have any questions?"

Any questions regarding the task were answered and participants were provided with 12 neutral pairs to practice the task and become familiar with the apparatus. Following this any confusion regarding the task was resolved.

Next participants were asked to complete the task with the awareness word set at an exposure time of 100ms and to read aloud any words that they could. This was completed to establish an individual threshold exposure time for word stimulus. Trials of five words were repeated until the participant could not read any of the stimulus words. On each trial the exposure time was shortened by 10ms. This was completed to ensure that the participants had no conscious awareness of the stimulus presentation in the subliminal presentation block (e.g., Edwards et al., 2006). Participants were then given the two mood scales to complete.

After this the experimenter adjusted the individual presentation time for the participant, sat behind a partition in the room and allowed the participant to complete the 260-word pairs presented subliminally. To address Fox's (1996) and Luecken et al.'s (2004) concerns regarding conscious priming creating attentional bias at the subliminal level, the subliminal processing series came first for each participant. On completion of this, participants were asked again to complete an additional five word pairs presented at the subliminal level and to read aloud any words that they could. This was done to ensure that no participant was consciously aware of presented stimuli consistent with past research (e.g., Edwards et al., 2007).

Participants were next given a break of approximately five minutes, remaining in the laboratory and were then asked to complete again the two analogue mood scales. They were then re-seated in front of the computer screen to complete the 260 supraliminal word pair block (1500 milliseconds). Following the completion of this trial the participants were invited to respond to the two mood scales a final time.

To conclude the session participants were administered the NART-2. All participants were then fully debriefed regarding the experiment's purpose. The whole session took approximately 90 to 120 minutes.

Data Analysis Strategy

In order to test the main hypotheses of the present study, two repeated measures analysis of variance (ANOVA) procedures were utilised. The ANOVA design included one between subjects factor: Group, which had five levels: 1) No Cardiovascular Disease and Low Heart-Focused Anxiety, Low Trait Anxiety (NoCVD-LowHFA); 2) No Cardiovascular Disease, Low Heart-Focused Anxiety and High Trait Anxiety (NoCVD-LowHFA-HTA); 3) Cardiac Disease and Low Heart-Focused Anxiety (CVD-LowHFA); 4) No Cardiac Disease and High Heart Focused Anxiety (NoCVD-HighHFA); and 5) Cardiac Disease and High Heart Focused Anxiety (CVD-

HighHFA). The design also included a within subject factor: Word Type. The Word Type factor had seven levels: Heart-High Threat, Heart-Moderate Threat, Heart-High Positive, Social-High Positive, Social-High Threat, Disaster-High Threat, and Neutral. Separate ANOVAs were conducted for Subliminal and Supraliminal presentations. Whenever the hypothesis under consideration predicted a differential pattern of Word by Group effects depending on the duration of presentation, an ANOVA was conducted with an additional within-subject variable: Duration of presentation. The purpose of this ANOVA design was to test the significance of a three-way Duration by Word by Group interaction effect.

Analyses were conducted using the SPSS 15 software package (SPSS, 2006). An alpha level of .05 was employed to test the null hypotheses. The assumption of sphericity was assessed using Mauchley's sphericity test. The sphericity assumption holds if the variance of the dependent variables is equal for varied levels of the within-subject factor. If the assumption of sphericity is violated, the analysis may be biased toward false rejection of the Null Hypothesis. Consequently, if it was found that the sphericity assumption is violated, the Greenhouse-Geisser correction to the degrees of freedom was employed. This correction reduces the degrees of freedom in the analysis, so the test of the Null Hypothesis is more conservative.

In order to interpret the results of the ANOVA's, planned comparisons were made between the word-type conditions within each level of the Group and Duration conditions. These planned comparisons provide critical information about the pattern of attentional biases between different word types, and the extent to which the pattern of attentional biases conforms to the predictions of the main hypotheses of the present study.

Additional analyses were conducted to examine the extent to which factors that were confounded with the between-subject Group factor might account for significant differences between levels of the Group factor. In these follow-up analyses, confounding factors were entered as covariates in the model, and the significance of hypothesised main and interaction effects were assessed when the covariates was included.

Chapter 12

Results

This section is organised into three subsections. The first presents information on the five experimental groups including the results that examine the effects of the participant selection criteria and information on the data preparation. The second subsection presents the analyses that addressed the main hypotheses of the present investigation. The third subsection considers whether certain demographic and psychological factors might be confounded with the independent variables in this study, and therefore offer plausible rival explanations for the findings of the main analyses. Further secondary analyses were conducted to determine whether the effects reported in the main analyses are still significant after controlling statistically for potential confounding variables.

1. Preliminary Analyses

Preparation of the Data

Participants were excluded from the analysis if they had an error rate greater than ten percent in either the subliminal or the supraliminal presentation condition because it was then assumed that either these participants had compromised fine-motor control, or they did not fully comprehend the task. Twenty-eight participants were excluded from the final data set, indicating 15.7% of all participants were removed from the sample due to error or slow latency responses. Preliminary analyses considered the impact of this selection criterion on the design of the study. The proportion of participants eliminated did not differ significantly between the five experimental groups (Fisher's

Exact p = .098). Participants with CVD who were excluded did not differ significantly from those who were included in terms of the duration ($t(175) = .94$, $p = .35$) and severity ($t(175) = 1.19$, $p = .23$) of CVD symptoms. However, the excluded participants were significantly older than those who were not excluded ($t(175) = 4.71$; $p < .05$). Specifically, the average age of the excluded participants was 70 years, compared with 61 years for the included participants.

Of those participants included, individual reactions times (RT) three standard deviations greater or less than each participant's mean RT were also excluded from the analysis (Kroeze & Van den Hout, 2000). Scores of three standard deviations above or below an individual's mean RT are linked to poor concentration or participant anticipation error (Kroeze & Van den Hout, 2000).

Mean response latencies were then calculated for each participant under each of the conditions, representing all the possible combinations of exposure times, word type, word position and probe position. To test the main hypotheses, attentional bias scores were calculated from the mean reaction time data (cf., MacLeod & Mathews, 1988; Mogg & Bradley, 1999). Bias scores were obtained by subtracting the mean reaction time when the target stimulus and probe were in the same position, from the mean reaction time when the target and probe were in different positions, (word upper, probe upper + word lower, probe lower) – (word upper, probe lower + word lower, probe upper). Positive bias scores arise from faster reaction times when the probe appears in the same position as the target stimulus rather than the neutral stimulus (reflecting an attentional bias towards the target stimulus type). By similar reasoning, a negative score indicates attention being directed away from the target stimulus type.

Establishing Experimental Groups

Participants with and without CVD were classified as high or low in HFA as measured by the CAQ (Eifert et al., 2000). A median split of all participants' scores on this scale was used to determine the high and low HFA groups. Of the CVD experimental group (n = 63) individuals with scores $\geq$1.2 were allocated to the high HFA group (n = 35, 24 males, 11 females) and those with scores $\leq$ 1.1 were allocated to the low HFA CVD group (n = 28, 16 males, 12 females). Using the same criteria, non-CVD participants (n = 67) were allocated to the high HFA (n = 29, 12 males, 17 females) and low HFA non-CVD experimental group (n = 38, 28 males, 10 females).

Additionally, participants with Trait STAI scores of greater than 40 with low HFA were placed in the high trait anxiety group, creating a fifth experimental group comprised of individuals scoring low in HFA without CVD, but with high trait anxiety (n = 19, 8 males, 11 females). This was created as a control group to allow for the testing of the Content-Specificity hypothesis, by which individuals with general high trait anxiety should show a similar level of attentional bias to all High-Threat stimulus words. Individuals with scores of 39 and below on the Trait STAI were considered normal to low in trait Anxiety. The cut-off scores for Trait anxiety in this study were selected because the mean Trait anxiety score for adults aged between 60-69 years of age is 33 in males and 30.7 in females (Spielberger et al., 1983), so a score of 40 should capture participants with meaningfully high trait anxiety scores based on the mean age of the participants in the current study (64.5 years).

Means and standard deviations on measures pertinent to the development of five reliable experimental groups are presented in table 12.1. Measures include, participant age (years), reading ability (NART-2), Heart Focused Anxiety (CAQ) score, State and Trait anxiety (STAI) score and Social Desirability (MC-SDS) score.

Table 12.1

Means and Standard Deviations of the Five Experimental Groups on Measures of Age (years), Reading Ability (NART-2), Heart Focused Anxiety (CAQ), State and Trait Anxiety (STAI) and Social Desirability (MC-SDS).

	Group									
	Non Heart Disease		Non Heart Disease		Heart Disease		Non Heart Disease		Heart Disease	
Measure	Low HFA (n =38)		High Trait Anxiety (n =19)		Low HFA (n =28)		High HFA (n =29)		High HFA (n =35)	
	Mean	SD	Mea n	SD	Mea n	SD	Mea n	SD	Mean	SD
AGE	65.29	13.27	59.89	16.48	67.7	11.25	60.93	13.78	61.71	11.69
NART	37.29	5.70	37.21	5.25	37.8	5.72	37.41	5.82	37.21	7.72
CAQ	.634	.250	0.57	0.22	0.63	0.26	1.596	0.34	1.68	0.47
STAI-Trait	30.79	5.12	48.63	5.48	30.9	9.04	45.48	9.50	42.18	10.70
STAI-State	30.18	6.47	34.42	10.9	29.7	8.46	38.45	9.46	36.62	11.12
MC-SD	18.68	4.69	13.65	5.81	18.8	5.98	16.97	6.62	16.80	5.25

Note. SD = Standard Deviation

An alpha level of 0.05 was adopted for all statistical analysis used to determine if experimental groups were appropriate for further experimental comparison and Tukey HSD was utilised for post-hoc tests as indicated.

In order to confirm that the five groups differed significantly with respect to Heart Focused Anxiety (HFA) and Trait Anxiety, one–way ANOVAs were conducted. The results of these analyses revealed significant differences in HFA ($F(4,145) = 88.07$; $p < .001$) and Trait Anxiety ($F(4,145) = 27.26$; $p < .001$). Post-hoc analyses using Tukey's HSD procedure revealed that HFA was significantly higher in the two High CVD groups than it was in the low CVD groups. Trait anxiety was significantly higher in the NoCVDLowHFA-HTA group compared with three of the other groups: 1) NoCVDLowHFA; 2) CVD-LowHFA and 3) CVD-HighHFA. These results confirm the establishment of five experimental groups as proposed in the methodology. Further, the groups differed significantly on State anxiety ($F(4, 145) = 5.15$; $p < .001$). Post-hoc analysis also using Tukey's HSD procedure revealed State anxiety was significantly higher in NoCVD-HighHFA when compared with the NoCVD-LowHFA and CVD-LowHFA groups.

Further analysis was conducted to ensure that the five experimental groups did not significantly differ in their composition for age, sex, reading ability (NART-2), Social Desirability and Repression scores. A one-way ANOVA examined age across each of the experimental groups, a non-significant result $F(4, 145) = 1.60$, $p = .177$ indicating that the results cannot be attributed to age difference across the groups. A Pearson's Chi-square test was used to examine sex ratio across experimental groups and indicates a statistically significant difference in sex distribution across groups, X^2 (4, N = 149) = 10.72, p =0 .03. This issue is addressed in subsection three of the results section. A one-way ANOVA indicated that the NART-2 scores across groups did not differ significantly, $F(4,143) = .06$, $p = 0.99$, indicating that any differences across experimental groups were not due to vocabulary/verbal intelligence. A one-way ANOVA examined Social Desirability (MC-SDS) scores across the experimental groups and found a non-significant difference between them $F(4,145) = 3.11$, $p = 0.17$.

Finally, participants were also categorised into four coping style types as proposed by Weinberger (1990) to control for the possible affect of repressive coping style on reported level of anxiety and attentional bias patterns. A Chi-square test was used to examine coping types across experimental groups. Pearson's Chi-square indicates a statistically significant difference in type distribution across groups, X^2 (12, N = 149) = 84.66, p = < .001. This issue is addressed in section three of the results section. The percentage composition of each group's coping style is presented in Table 12.2.

Table 12.2: Percentage Composition of the Experimental Groups Coping Style

	No CVD Low HFA (n = 38) %	No CVD Low HFA (n = 19) %	CVD Low HFA-HTA (n = 28) %	No CVD High HFA (n = 29) %	CVD High HFA (n = 35) %
Repressor	42.6%	0%	26.5%	13.2%	17.6%
True Anxious	0%	27.7%	0%	38.8%	33.3%
True Low Anxious	40.9%	0%	40.9%	9.0%	9.0%
Defensive	0%	39.1%	4.3%	17.4%	39.1%

Further, individuals with a family member with a history of CVD might display higher levels of HFA, and a larger attentional bias towards threatening cardiac-related information (Eifert, 1992). However, the proportion of participants who had a family member with CVD did not differ significantly between the five groups (X^2 (4) = 0.92; p > .05). Therefore, having a family member with CVD is not confounded with membership in these groups.

Furthermore, for the CVD participants a statistical check for the differences in the duration and the severity of their CVD illness was conducted. A one-way ANOVA indicated that there was no significant difference in duration of illness between the CVD participants in the high HFA (M = 6.10; SD = 5.6) and low HFA (M = 5.27; SD

= 5.19) groups ($F(1, 62) = 7.18, p = .62$). A one-way ANOVA indicated that there was a significant difference in severity of illness between those low and high in HFA with CVD ($F(1,62) = 5.915, p = .018$). Those high in HFA (M = 2.94; SD = 0.91) received significantly higher severity rating than those with low HFA (M = 2.43; SD = 0.997). This issue is addressed in subsection three.

The Subliminal Awareness Check

All participants reported being unable to perceive the stimuli presented in the Subliminal condition. The proportion of pairs with the correct response was tallied for each participant. The results indicated that although a participant was removed from the analysis because one of the five words was read aloud, no other participants were able to name any of the words correctly.

2. Main Analyses

The main hypotheses of the present study suggested that the differential effect of Word Type on attention depended on the following between-subject factors: Heart-Focused Anxiety (HFA), Cardiovascular Disease (CVD), and Trait Anxiety. To test the main hypotheses, repeated measures analysis of variance was conducted. Word type was treated as a within-subjects factor with seven levels (Heart-High Threat, Heart-Moderate Threat, Heart–High Positive, Social-High Threat, Social-High Positive, Disaster-High Threat, and Neutral). Combinations of HFA, CVD, and Trait Anxiety were treated as a single between-subjects factor with five levels: 1) NoCVD-LowHFA; 2) NoCVD-LowHFA-HTA; 3) CVD-LowHFA; 4) NoCVD-HighHFA; and 5) CVD-HighHFA. Separate ANOVAs were conducted for words presented subliminally and supraliminally. Additional ANOVAs were conducted to test the predictions of specific hypotheses that went beyond the scope of the main repeated measures ANOVAs and details of those specialised analyses are presented in the relevant sections of these results.

A critical assumption of the present study is that some word types evoke differential levels of attentional bias. Preliminary analyses indicated the bias scores differed significantly between Word types. A one-way repeated measures Analysis of Variance was employed to test the significance of differences in bias between word types. In the Subliminal presentation condition, levels of attentional bias differed significantly between Word types ($F(3.77, 557.93) = 32.34, p < .001$). Similarly, in the Supraliminal condition, levels of attentional bias differed significantly between Word types ($F(4.55, 673.85) = 34.67, p < .001$).

Descriptive statistics of the bias index scores for each level of the between-subject factors are shown in Tables 12.3 and 12.4.

Table 12.3: Descriptive Statistics: Subliminal Condition

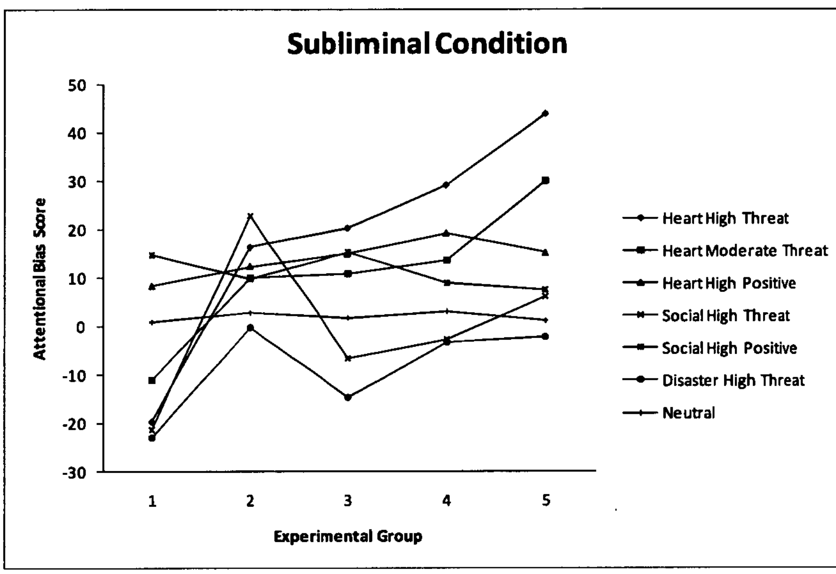
	No CVD Low HFA (n = 38)		No CVD Low HFA (n = 19)		CVD Low HFA-HTA (n = 28)		No CVD High HFA (n = 29)		CVD High HFA (n = 35)	
	SD	M	SD	M	SD	M	SD	M	SD	M
Heart High Threat	-19.6	18.4	16.3	15.2	20.2	12.4	29.1	20.6	43.8	13.2
Heart Moderate Threat	-11.1	12.8	10.1	21.8	10.8	10.5	13.6	15.7	30.0	1.6
Heart High Positive	8.2	13.5	12.3	10.5	14.9	10.3	19.2	28.1	15.1	14.9
Social High Threat	21.5	14.8	22.7	15.7	-6.7	22.3	-2.8	16.9	6.0	24.1
Social High Positive	14.6	12.9	9.6	16.3	15.3	18.3	8.9	1.8	7.4	24.1
Disaster High Threat	-23.0	27.0	-0.2	29.2	-14.7	25.1	-3.3	48.2	-2.2	31.4
Neutral	0.9	3.0	2.7	7.3	1.7	3.5	2.9	4.5	1.1	3.5

Table 12.4: Descriptive Statistics: Supraliminal Condition

	No CVD Low HFA (n = 38)		No CVD Low HFA (n = 19)		CVD Low HFA-HTA (n = 28)		No CVD High HFA (n = 29)		CVD High HFA (n = 35)	
	SD	M	SD	M	SD	M	SD	M	SD	M
Heart High Threat	-16.7	22.9	10.7	16.5	18.5	14.9	21.6	19.4	28.6	19.1
Heart Moderate Threat	-6.1	14.8	4.8	10.9	10.4	12.8	6.8	19.4	22.4	18.9
Heart High Positive	5.3	12.5	8.2	11.3	12.0	13.9	15.5	22.8	1.4	19.8
Social High Threat	-18.2	15.3	12.0	21.5	-12.6	25.5	-3.1	17.6	-0.4	20.9
Social High Positive	13.2	13.3	10.0	25.9	17.4	10.4	12.0	18.9	11.0	16.3
Disaster High Threat	-20.3	26.4	-14.1	31.0	-1.3	22.0	-1.8	393	-10.5	23.5
Neutral	1.1	2.6	1.4	1.9	0.5	2.3	2.8	7.0	0.1	17.3

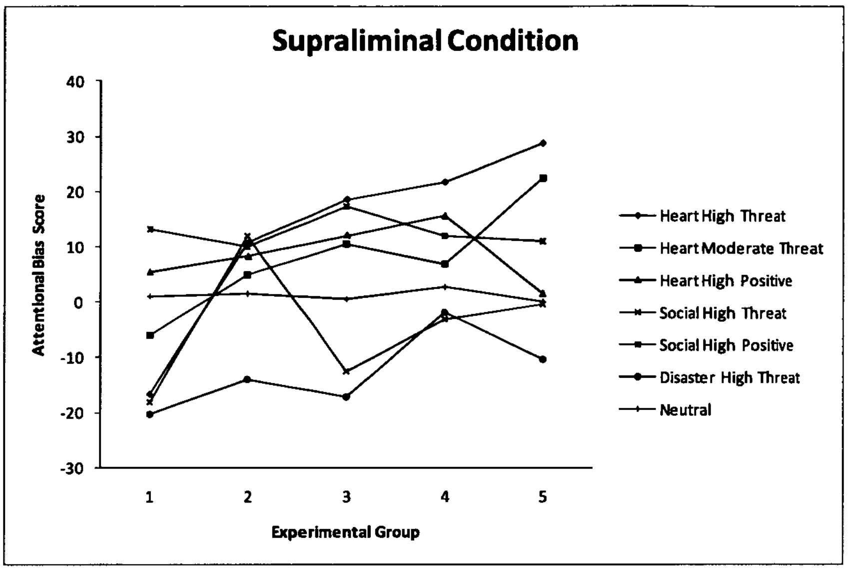
ANOVA results for the Subliminal presentation condition indicate a significant main effect for group ($F(4,144) = 36.29, p <.001$) and word ($F(3.51, 504.8) =34.98, p < .001$). The interaction between group and word type was also significant ($F(14.02, 504.8) = 10.2, p <.001$). ANOVA results for the Supraliminal presentation condition also indicate a significant main effect for group ($F(4, 144) = 19.24, p <.001$) and word ($F(4.46, 642.08) = 36.44, p <.001$). Additionally, the interaction between group and word type was also significant ($F(17.84, 642.8) = 6.47, p <.001$). The assumption of sphericity was not met in these analyses, so the Greenhouse Geisser degrees of freedom are used throughout to reduce the risk of falsely rejecting the null hypothesis.

In lieu of presenting voluminous tables of post-hoc tests (See Appendix G), the mean bias index scores for each group on the seven word types are presented in graphical form. Estimated marginal means of the attentional bias index scores for the Subliminal condition are presented in Figure 12.1, while those for the Supraliminal Condition are shown in Figure 12.2. Findings for specific planned comparisons relevant to each of the main hypotheses are reported in the text. To guard against the risk of Type I error, the present investigation utilised Tukey's HSD test to compare group means. The HSD test employs a t-test to compare group means, but corrects the alpha level to adjust for the experiment-wide Type I error rate. The HSD test is more conservative when group sizes are unequal, as they are in the present study, further reducing the risk of Type I error.



Note: Groups: 1 = NoCVD-LowHFA; 2 = NoCVD-LowHFA-HTA; 3 = CVD-LowHFA; 4 = NoCVD-HighHFA; 5 = CVD-HighHFA.

Figure 12.1: Attention By Word and Group in the Subliminal Presentation Condition



Note: Groups: 1 = NoCVD-LowHFA; 2 = NoCVD-lowHFA-HTA; 3 = CVD-Low HFA; 4 = NoCVD-HighHFA; 5 = CVD-HighHFA.

Figure 12.2: Attention By Word and Group in the Supraliminal Presentation Condition

1. Content- Specificity Hypothesis

Hypothesis 1.1: High HFA participants, either with or without CVD, will display a significant attentional bias toward Heart-High Threat information when compared to other emotionally valenced stimuli. Conversely low HFA participants without CVD (Healthy controls) will direct attention away from Heart-High Threat information. High Trait anxious individuals will display a significant attentional bias towards all high threat stimulus.

Planned comparisons were conducted using Tukey's HSD procedure as described above. This hypothesis received support from the planned comparisons among High HFA participants. Consistent with this hypothesis, in the Subliminal condition, the NoCVD-HighHFA and the CVD-HighHFA groups both directed significantly more attention to Heart-High Threat words than to words in any other category. Specifically, for the NoCVD-HighHFA group, higher levels of attention were given to Heart-High Threat words than to Heart-Moderate Threat (Difference = 15.5; SE = 2.85; $p < .001$), Heart-High Positive (Difference = 9.1; SE = 3.54; $p < .01$), Social-High Threat (Difference = 31.9; SE = 4.36; $p < .001$), Social-High Positive (Difference = 20.2; SE = 5.13; $p < .001$), Disaster-High Threat (Difference = 32.4; SE = 6.79; $p < .001$), and Neutral words (Difference = 26.3; SE = 3.09; $p < .001$). Similarly, the CVD-HighHFA participants gave significantly more attention to Heart-High Threat words than to Heart-Moderate Threat (Difference = 13.8; SE = 2.59; $p < .001$), Heart-High Positive (Difference = 28.7; SE = 3.22; p < .001), Social-High Threat (Difference = 37.7; SE = 3.97; $p < .001$), Social-High Positive (Difference = 36.3; SE = 4.67; $p < .001$), Disaster-High Threat (Difference = 45.9; SE = 6.18; $p < .001$), and Neutral (Difference = 42.6; SE = 2.81; $p < .001$) word types. Estimated means of the attentional bias index scores for NoCVD-HighHFA in the Subliminal condition are presented in Figure 12.3, while those for the CVD-HighHFA are shown in Figure 12.4.

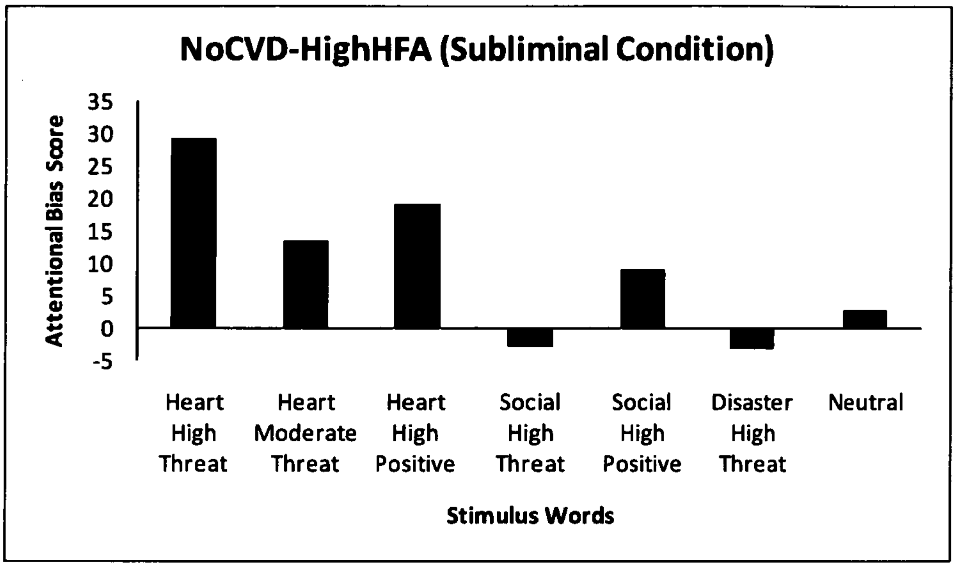


Figure 12.3: NoCVD-HighHFA, Attentional Bias Index Score to Word Type in the Subliminal Presentation Condition

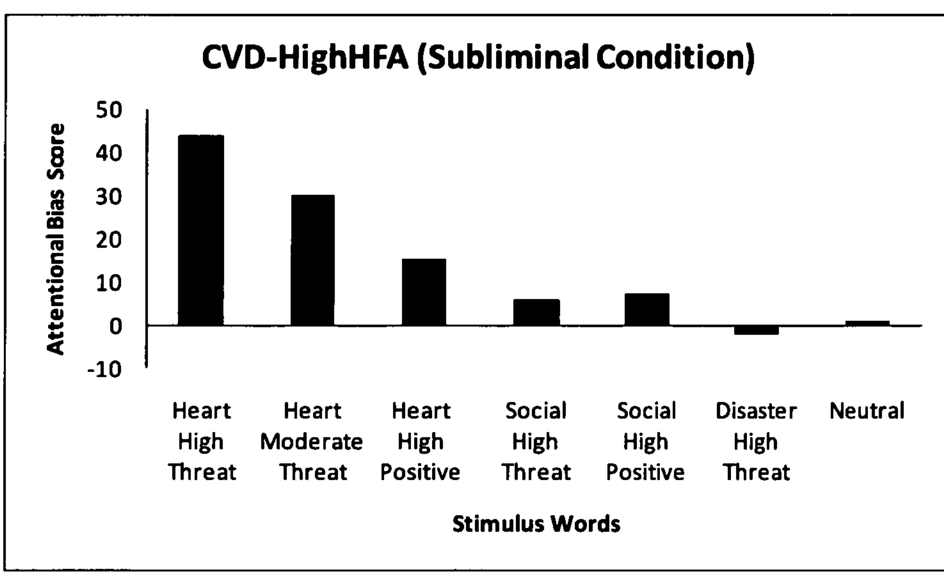


Figure 12.4: CVD-HighHFA, Attentional Bias Index Score By Word in the Subliminal Presentation Condition

The findings from the Subliminal condition were largely replicated in the Supraliminal condition. The NoCVD-HighHFA group gave significantly more attention to the Heart-High Threat words than to Heart-Moderate Threat (Difference = 14.8; SE = 3.65; $p < .001$), Social-High Threat (Difference = 24.7; SE = 5.10; $p < .001$), Disaster-High Threat (Difference = 23.3; SE = 6.44; $p < .001$) and Neutral words (Difference = 18.8; SE = 3.80; $p < .001$), although no significant differences in attention were found for Heart-High Positive and Social-High Positive words. In the Supraliminal condition, the CVD-HighHFA group also gave significantly more attention to Heart-High Threat words than to words in any other category except Heart-Moderate Threat words. Specifically, in this group, significantly more attention was given to Heart-High Threat than to Heart-High Positive words (Difference = 27.3; SE = 4.30; $p < .001$), Social-High Threat (Difference = 29.1; SE = 4.30; p < .001), Social-High Positive (Difference = 17.6; SE = 4.77; $p < .001$), Disaster-High Threat (Difference = 39.2; SE = 5.86; p < .001), or Neutral (Difference = 28.5; SE = 3.46; $p < .001$) word types. Estimated means of the attentional bias index scores for NoCVD-HighHFA in the Supraliminal condition are presented in Figure 12.5, while those for the CVD-HighHFA are shown in Figure 12.6.

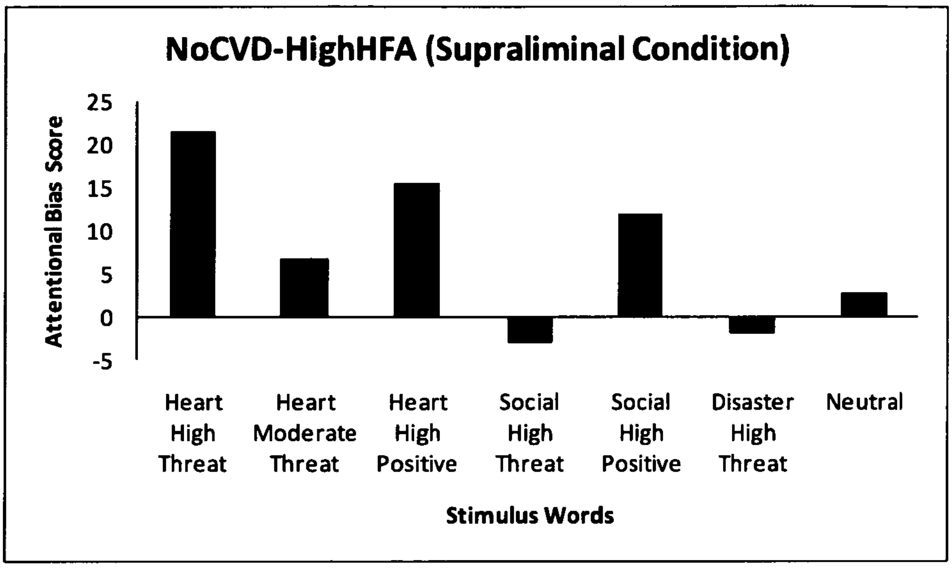


Figure 12.5: NoCVD-HighHFA, Attentional Bias Index Score By Word in the Supraliminal Presentation Condition

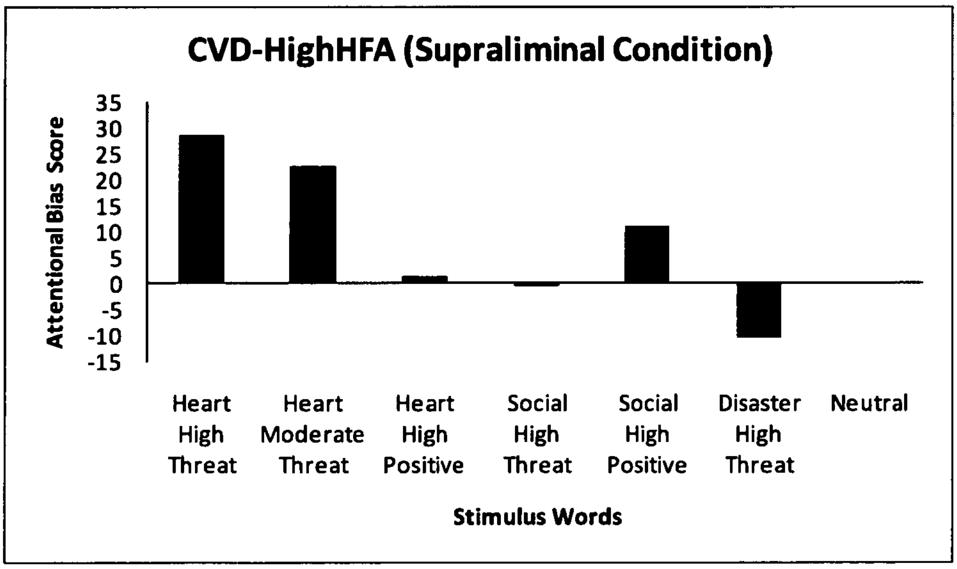


Figure 12.6: CVD-HighHFA, Attentional Bias Index Score By Word in the Supraliminal Presentation Condition

The converse prediction concerning the NoCVD-LowHFA participants received partial support from the post-hoc analyses. Consistent with the hypothesis, in the Subliminal and the Supraliminal conditions, the NoCVD-LowHFA participants gave significantly less attention to Heart-High Threat words than they did to other word types. Specifically, in the subliminal condition, significantly less attention was paid to Heart-High Threat than to Heart-Moderate Threat (Difference = -8.5; SE = 2.89; $p < .001$), Heart-High Positive (Difference = -27.8; SE = 3.10; $p < .001$), Social-High Positive (Difference = -34.2; SE = 4.84; $p < .001$), and Neutral words (Difference = -20.5; SE = 2.70; $p < .001$). In the Supraliminal Condition, significantly less attention was given to the Heart-High Threat words than to the Heart-Moderate Threat (Difference = -10.7; SE = 3.19; $p < .001$), Heart-High Positive (Difference =-22.1; SE = 4.13; $p < .001$), Social-High Positive (Difference = 29.9; SE = 4.58; $p < .001$) and Neutral (Difference = -17.8; SE = 3.32; p < .001). However, this pattern was not replicated in the noCVD-LowHFA-HTA or the CVD-LowHFA groups. Estimated means of the attentional bias index scores for NoCVD-LowHFA in the Subliminal condition are presented in Figure 12.7, while those for the supraliminal condition are shown in Figure 12.8.

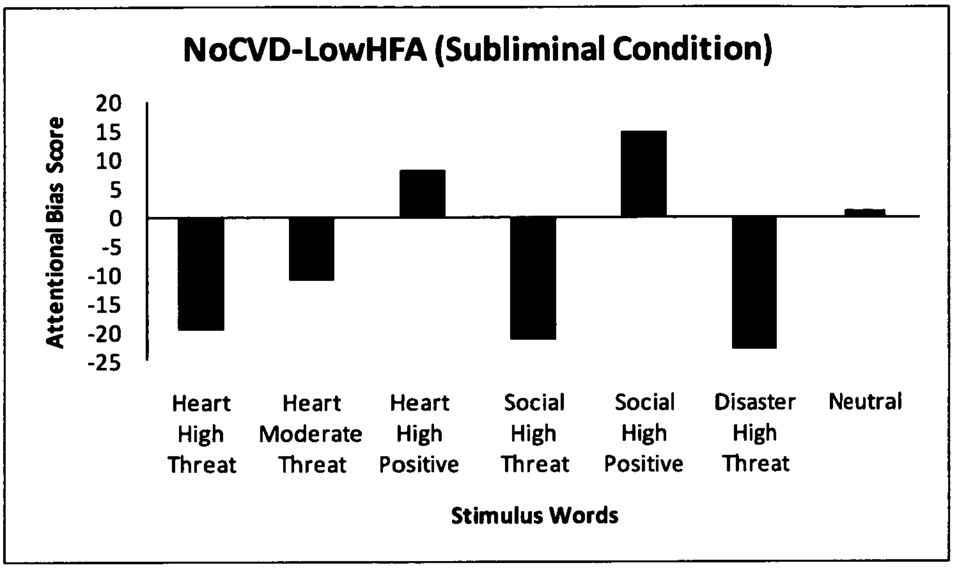


Figure 12.7: NoCVD-LowHFA, Attentional Bias Index Score By Word in the Subliminal Presentation Condition

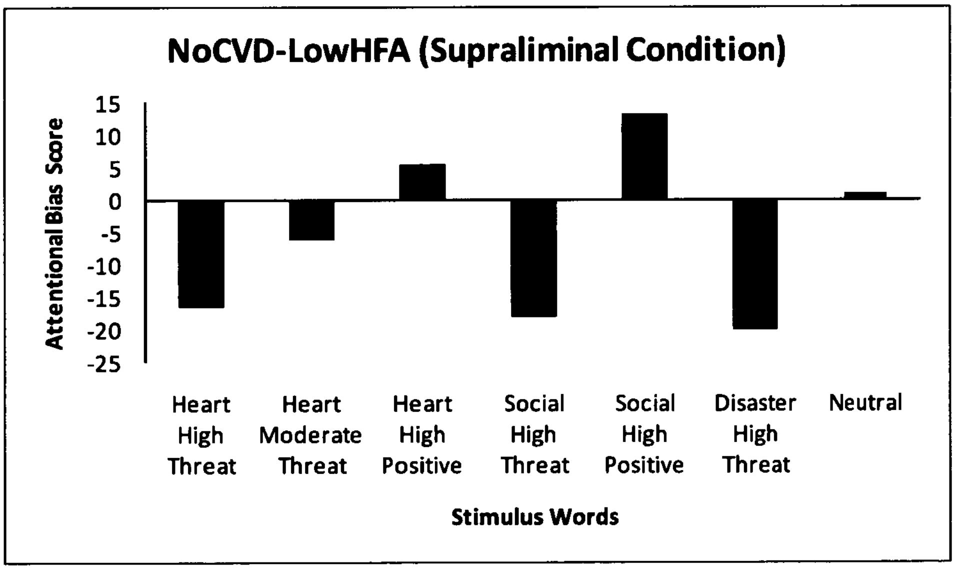


Figure 12.8: NoCVD-LowHFA, Attentional Bias Index Score By Word in the Supraliminal Presentation Condition

In the NoCVD-LowHFA-HTA group, differences in attention between Heart-High Threat and other word types were in most cases not statistically significant. In the Subliminal condition, this group displayed significantly *more* attention to the Heart-High Threat words than to the Neutral words (Difference = 13.7; SE = 3.81; $p < .001$). At the Supraliminal level this group displayed significantly more attention to Heart-High Threat compared to Disaster-High Threat words (Difference = 24.8; $p < .005$). To further explore the hypothesis that high Trait individuals would display an attentional bias towards all negative words, post hoc comparisons for all other high threat words are examined (Social and Disaster). In the subliminal condition, this group displayed significantly more attention towards Social-High threat words than to Heart-Moderate (Difference = 12.5; SE = 5.3, $p < .05$), Social-High Positive (Difference = 13.1; SE = 6.5, $p < .05$), Disaster-High Threat (Difference = 22.8; SE = 7.8, $p < .005$) and Neutral (Difference = 20.0; SE =4.5, $p < .001$). The high Trait group displayed no significant differences in attention towards or away from Disaster-High Threat words at the subliminal level compared to other word types, besides Social-High Threat which was attended to more (Difference = -22.85; SE = 7.8, $p < .005$). At the Supraliminal level, the NoCVD-LowHFA-HTA group displayed more attention towards Social-High threat words when compared to Disaster-High Threat (Difference = 26.0; SE = 7.3, $p < .001$) and Neutral words (Difference = 10.5; SE = 5.2, $p < .05$). Further at this level the high trait participants displayed significantly more attention *away* from Disaster-high Threat words compared to Heart-High Threat (Difference = -24.8; SE = 7.9, $p < .005$), Heart-Moderate Threat (Difference = - 18.9; SE = 7.4, $p < .05$), Heart-High Positive (Difference = -22.2; SE = 7.9, $p < .01$), Social-High Threat (Difference = -26.0; SE = 7.3, $p < .001$) and Social-High Positive (Difference = -24.1; SE = 7.1, $p < .001$) and

Neutral (Difference = -15; SE = 7.0, $p < .05$) words. Estimated means of the attentional bias index scores for NoCVD-LowHFA-HTA in the Subliminal condition are presented in Figure 12.9, while those for the supraliminal condition are shown in Figure 12.10.

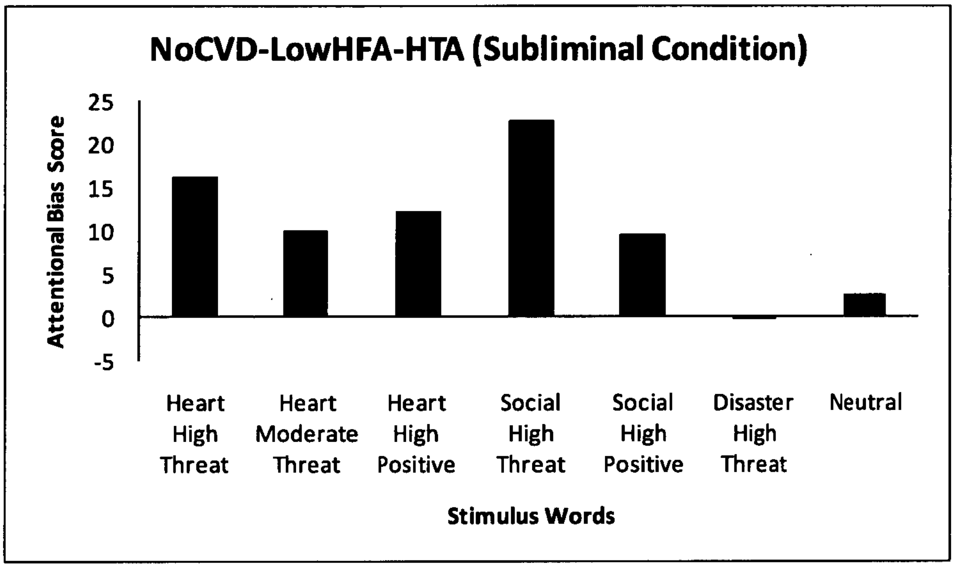


Figure 12.9: NoCVD-LowHFA-HTA Attentional Bias Index Score By Word, in the Subliminal Presentation Condition

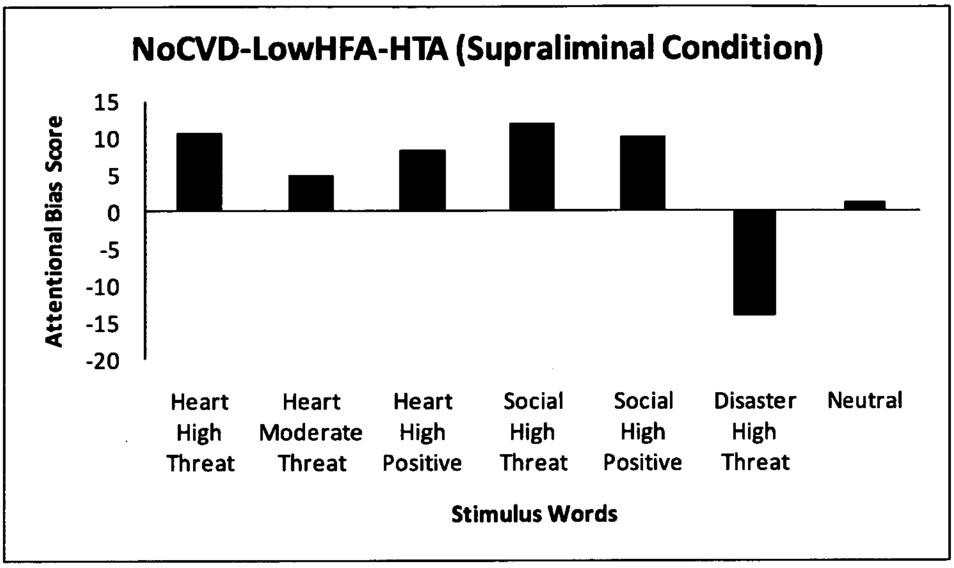


Figure 12.10: NoCVD-LowHFA-HTA, Attentional Bias Index Score By Word in the Supraliminal Presentation Condition

The cumulative pattern of these findings suggests that the high HFA groups show an attentional bias toward Heart-High Threat words that is not displayed by the NoCVD-LowHFA or NoCVD-LowHFA-HTA group. Further High Trait participants show some tendency to selectively attend towards social high threat words compared to other word types at the Subconscious level of processing, and some evidence of avoidance of disaster threat words at the conscious level of processing.

Hypothesis 1.2: Individuals with CVD and low HFA will display an attentional bias towards Heart-threat (High and Moderate) related words but not Social-High Threat or Disaster-High Threat words (due to familiarity/relevance), from which they will attend away.

The results of the planned comparisons provide consistent support for this hypothesis. Under Subliminal presentation, CVD-LowHFA participants give significantly more attention to Heart-High Threat Words than to Social-High Threat (Difference = 29.9; SE = 4.44; $p < .001$) or Disaster-High Threat words (Difference = 34.9; SE = 6.91; $p < .001$). These participants also give significantly more attention to Heart-Moderate threat words than to Social-High Threat (Difference = 17.5; SE = 4.40; $p < .001$) or Disaster High Threat words (Difference = 25.5; SE = 7.05; $p < .001$). Heart-High Positive words also received more attention than Social-High Threat (Difference = 21.6; SE = 4.91; $p < .001$) or Disaster-High Threat words (Difference = 29.6; SE = 6.78; $p < .001$). Turning to the results from the Supraliminal presentation condition, CVD-LowHFA participants give significantly more attention to Heart-High Threat Words than to Social-High Threat (Difference = 31.0; SE = 5.19; $p < .001$) or Disaster-High Threat words (Difference = 35.8; SE = 6.55; $p < .001$). These participants also give significantly more attention to Heart-Moderate Threat words than to Social-High Threat (Difference = 22.9; SE = 4.57; $p < .001$) or Disaster-High Threat words (Difference = 27.7; SE = 6.12; $p < .001$). Heart-High Positive words also received more attention than Social-High Threat (Difference = 25.5; SE = 4.83; $p < .001$) or Disaster-High Threat words (Difference = 29.3; SE = 6.54; $p < .001$).

The CVD-LowHFA group paid significantly *less* attention to Social-High threat words and Disaster-High threat words in both the Subliminal and Supraliminal conditions. Specifically, in the preconscious condition this group paid *less* attention to Social-High Threat words than to Heart-High Threat (Difference = -26.9; SE = 4.44; $p < .001$), Heart-Moderate Threat (Difference = -17.46; SE = 4.4; $p < .001$), Heart-High Positive (Difference = -21.6; SE = 4.9; $p < .001$), Social-High Positive

(Difference = -22.05; SE = 5.37; $p < .001$), and Neutral (Difference = -8.4; SE = 4.68; $p < .05$) words. They also paid less attention to Disaster-High Threat words than Heart-High Threat (Difference = -34.9; SE = 6.91; $p < .001$), Heart-Moderate Threat (Difference = -25,47; SE = 7.05; $p < .001$), Heart-High Positive (Difference = -29.6; SE = 6.8; $p < .001$), Social-High Positive (Difference = -30.05; SE = 6.88; $p < .001$), and Neutral (Difference = -16.38; SE = 6.3; $p < .01$). In the supraliminal condition this group paid less attention to Social-High Threat words than to Heart-High Threat (Difference = -31.02; SE = 5.2; $p < .001$), Heart-Moderate Threat (Difference = -22.92; SE = 4.5; p < .001), Heart-High Positive (Difference = -24.5; SE = 4.8; $p < .001$), Social-High Positive (Difference = -30.0; SE = 4.8; $p < .001$), and Neutral (Difference = -13.1; SE = 4.31; $p < .005$) words. In this condition they also paid less attentional to Disaster-High Threat than to Heart-High Threat (Difference = -35.8; SE = 6.5; $p < .001$), Heart-Moderate Threat (Difference = -27.7; SE = 6.1; $p < .001$), Heart-High Positive (Difference = -29.3; SE = 5.5; $p < .001$), Social-High Positive (Difference = -34.73; SE = 5.9; $p < .001$), and Neutral (Difference = -17.9; SE = 5.8; $p < .005$) words. Estimated means of the attentional bias index scores for CVD-LowHFA in the Subliminal condition are presented in Figure 12.11, while those for the Supraliminal condition are shown in Figure 12.12.

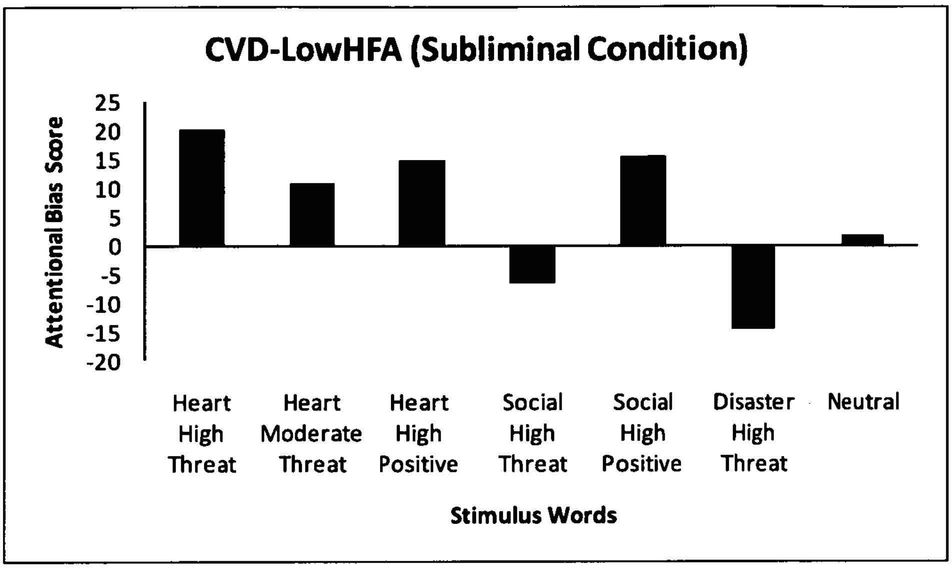


Figure 12.11: CVD-LowHFA, Attentional Bias Index Score By Word in the Supraliminal Presentation Condition

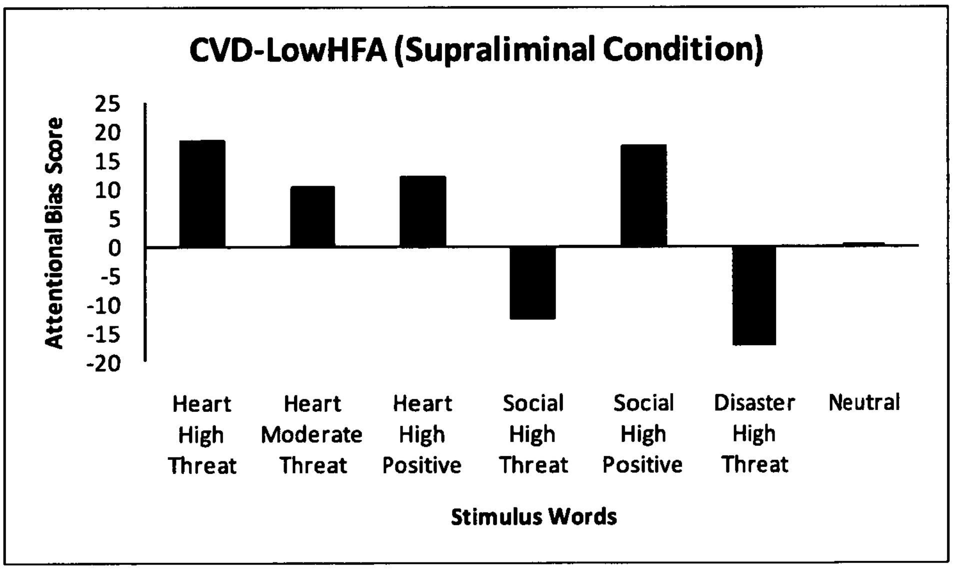


Figure 12.12: CVD-LowHFA, Attentional Bias Index Score By Word in the Subliminal Presentation Condition

Cumulatively, these findings support Hypothesis 1.2. The CVD-LowHFA group show a bias toward Heart Threat words only, and is in this respect more similar to the high HFA groups than to the low HFA groups. Further this group tend to direct attention away from other types of threat information.

Hypothesis 1.3: Non-CVD individuals high in HFA anxiety will display a greater attentional bias toward heart-related stimulus words than to other word types when compared with non-CVD individuals high in Trait anxiety (low HFA).

In order to test this hypothesis, the repeated measures ANOVAs were run with just the NoCVD-HighHFA and the NoCVD-LowHFA-HTA groups. This hypothesis predicts a significant Word type by Group interaction effect. The predicted two-way interaction effect was significant only in the Subliminal presentation condition (F (2.69, 123.7) = 3.40; $p < .05$). Participants in the NoCVD-HighHFA group displayed a significant attentional bias toward Heart-High Threat words, compared with words in all other categories. By contrast, NoCVD-LowHFA-HTA participants displayed a significant attentional bias in favour of Heart-High Threat words only in comparison with Neutral words. Turning to the Heart-Moderate Threat words, NoCVD-HighHFA participants displayed a significant attentional bias toward these words compared with Social-High Threat words (Difference = 16.5; SE = 4.76; $p < .05$), while noCVD-LowHFA-HTA participants gave significantly less attention to Heart-Moderate Threat words (Difference = -12.5; SE = 5.88; $p < .05$). Otherwise, differences in attentional bias concerning Heart-Moderate Threat words were not statistically significant. Lastly, NoCVD-HighHFA participants displayed a significant bias toward Heart-High Positive words compared with non-Heart related words. Significantly more attention was given to Heart-High Positive than to Social-High Threat words (Difference = 22.0; SE = 5.03; $p < .05$), Disaster-High Threat (Difference = 22.5; SE = 8.48; $p < .05$), and Neutral (Difference = 16.3; SE = 4.35; $p < .05$) words. NoCVD-LowHFA-HTA participants did not display a significant attentional bias to Heart-High Positive words. Estimated means of the attentional bias index scores for Non-CVD participants high in HFA and those low in HFA but high in Trait anxiety in the Subliminal condition are presented in Figure 12.13.

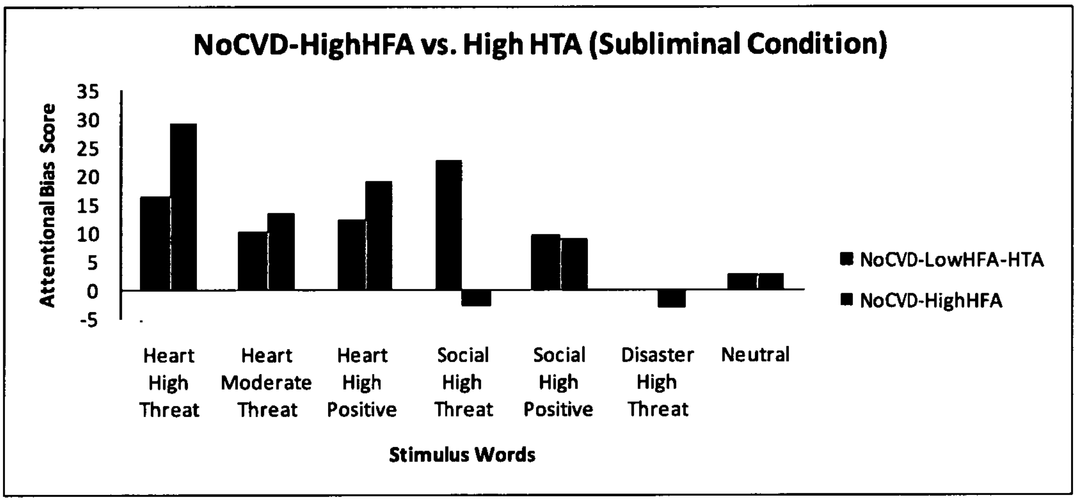


Figure 12.13: NoCVD-HighHFA and NoCVD-LowHFA-HTA, Attentional Bias Index Score By Word in the Subliminal Presentation Condition

Since the two-way Group by Word interaction was significant only in the Subliminal condition, additional analyses examined a potential three-way Group by Word by Duration interaction effect, using a 2 x 5 x 7 ANOVA. The three way interaction effect was statistically significant ($F(3.25,149.45) = 4.87$; $p < .01$).

In summary, the results of the analyses support Hypothesis 1.3 only under conditions of Subliminal presentation, and only when the heart-related words have a strong positive or negative emotional valence.

Hypothesis 1.4: CVD participants with high HFA will display a larger negative attentional bias to Heart-High Threat words than non-CVD participants with high HFA.

In order to test this hypothesis, the repeated measures ANOVAs were run with just the NoCVD-HighHFA and the CVD-HighHFA groups. This hypothesis predicts a significant Word by Group interaction effect. The predicted interaction effect was found only in the Supraliminal condition ($F(4.24, 262.6) = 3.43$; $p < .05$), not in the Subliminal condition ($F(3.08, 190.8) = 2.26$; $p > .05$). The attentional bias to Heart-High Threat words was stronger for the CVD-HighHFA than for the NoCVD-HighHFA group. Specifically the bias toward Heart-High Threat versus Heart-High Positive was 21.0 for the CVD-HighHFA participants, but only 6.1 for the noCVD-HighHFA participants. Higher attentional bias was also found in the CVD-HighHFA than in NoCVD-HighHFA group for Heart-High Threat versus Disaster-High Threat (32.9 versus 23.3) and Neutral (22.3 versus 18.8) words. Similar levels of attentional bias were found for Heart-High Threat versus Social-High Threat and Social-High Positive words. Estimated means of the attentional bias index scores for CVD participants high or Low in HFA in the Supraliminal condition are presented in Figure 12.14.

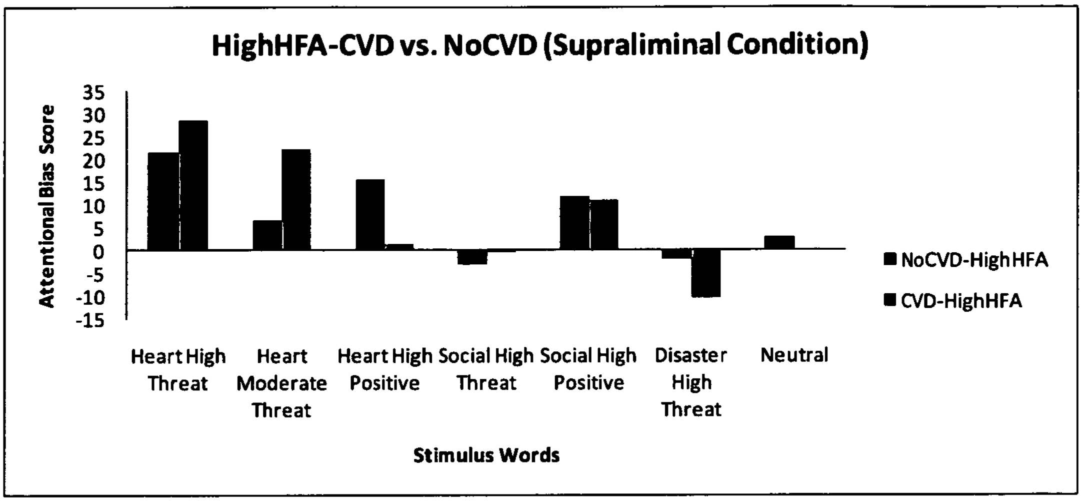


Figure 12.14: CVD-HighHFA and NoCVD-HighHFA, Attentional Bias Index Score By Word in the Subliminal Presentation Condition

In summary, Hypothesis 1.4 is consistent only with the findings from the Supraliminal Presentation condition, and only when comparing Heart-High Threat with Heart-High Positive, Disaster-High Threat and Neutral word types.

Since the two-way Group by Word interaction was significant only for some of the comparisons in the Supraliminal condition, additional analyses examined a potential three-way Group by Word by Duration interaction effect, using a 2 x 5 x 7 ANOVA. The three-way interaction effect was not statistically significant ($F(3.75,232.74) = 1.03$; $p > .39$).

2. The Role of Stimulus Threat Level

Hypothesis 2.1: Individuals high in HFA with CVD will display an attentional bias towards both high and moderately threatening heart-related information compared to those with low HFA and CVD who will display an attention bias towards high heart threat but not moderately threatening heart information (in accordance with the CMV, Mogg et al., 2000b).

Initial analysis of the data for the two groups with CVD revealed a significant two-way interaction between Word and Group (F(3,846, 220.36; $p < .001$), as predicted by the hypothesis. However, the three-way interaction of Word by Group by Duration was also significant ($F(3.612, 220.36) = 4.92$, $p < .001$), suggesting that the form of the Word by Group interaction may vary depending on the duration of presentation.

This hypothesis received partial support from the planned comparisons. Consistent with this hypothesis, CVD-HighHFA participants gave significantly more attention to Heart-High Threat at both levels of processing as discussed in connection with Hypothesis 1.1. Further they gave significantly more attention to Heart-Moderate Threat words than to most other word types. Specifically, in the Subliminal Condition, these participants gave more attention to Heart-Moderate Threat words than to Heart-High Positive (Difference = 14.9; SE = 2.44; $p < .001$), Social-high Threat (Difference = 23.9; SE = 4.193; $p < .001$), Social Positive (Difference = 22.5; SE = 4.27; p < .001), Disaster-High Threat (Difference = 32.1; SE = 4.92; $p < .001$) and Neutral (Difference = 28.8; SE = 1.98; $p < .001$) word types. Similarly, under the Supraliminal condition, these participants also gave more attention to Heart-Moderate Threat words than to Heart-High Positive (Difference = 21.0; SE = 3.7; $p < .001$), Social-High Threat (Difference = 22.8; SE = 4.61; $p < .001$), Social-High Positive (Difference = 11.4; SE = 4.17; $p < .01$), Disaster-High Threat (Difference =

32.9; SE = 4.44; $p < .001$) and Neutral (Difference = 22.3; SE = 3.19; $p < .001$) words.

Consistent with this hypothesis the CVD-LowHFA group directed more attention towards Heart-High Threat words than other threat words at both levels of processing as discussed in connection with Hypothesis 1.2. However contrary to the hypothesis, although the CVD-LowHFA group did not display a significant attentional bias to Heart-Moderate Threat Words over Heart-High Positive and Social-High Positive words, they did provide greater attention to Heart-Moderate Threat words over a narrower set of word types. Specifically, in the Subliminal condition, these participants gave more attention to Heart-Moderate Threat than to Social-High Threat (Difference = 17.5; SE = 4.69; $p < .001$), Disaster-High Threat (Difference = 25.5; SE =5.50; $p < .001$), and Neutral words (Difference = 9.1; SE = 2.21; $p < .001$). In the Supraliminal condition, similar findings emerge. CVD-LowHFA participants display significantly more attention to Heart-Moderate Threat than to Social-High Threat (Difference = 22.9; SE = 5.15; $p < .001$), Disaster-High Threat (Difference = 27.7; SE = 4.96; p < .001) and Neutral words (Difference = 9.84; SE = 33.57; $p < .001$).

Thus, in this group, attentional biases towards high threat heart-related words were also found for the Heart-Moderate related words. Estimated means of the attentional bias index scores for CVD participants high or Low in HFA in the Supraliminal condition for Heart-High and Heart-Moderate words are presented in Figure 12.15, while those for the Supraliminal condition are shown in Figure 12.16.

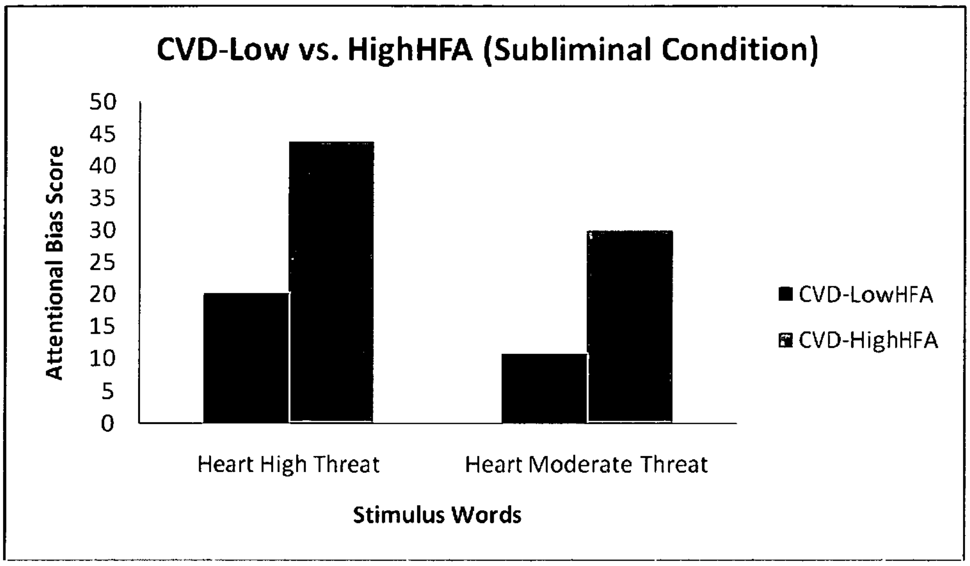


Figure 12.15: CVD-LowHFA and CVD-LowHFA, Attentional Bias Index Score By Heart-High and Heart Moderate Threat Words in the Subliminal Presentation Condition

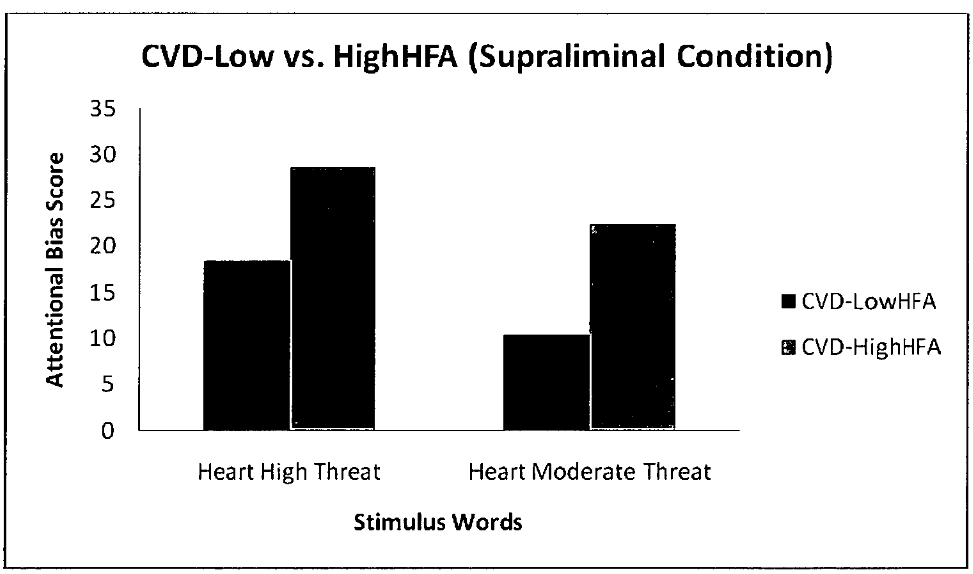


Figure 12.16: CVD-LowHFA and CVD-LowHFA, Attentional Bias Index Score By Heart-High and Heart-Moderate Threat Words in the Supraliminal Presentation Condition

3. The Role of Processing Level

Hypothesis 3.1: A specific attentional bias towards Heart-High Threat related words will be found in high HFA participants at both the subliminal and supraliminal level of processing (i.e., a vigilance-avoidance pattern will not be found in this population as proposed by Eifert et al., 2000b in the HFA model). Since this hypothesis implies that the high HFA groups differ from the three low-HFA groups, the ANOVA results for all five groups, presented earlier, were utilised. The three-way interaction of Group, Word, and Duration was not examined, as the hypothesis only states that the attentional bias will be found in both subliminal and supraliminal conditions, not that the magnitude of the attentional bias will be equivalent under both conditions of presentation.

The results of the planned comparisons support this hypothesis. NoCVD-HighHFA and CVD-HighHFA participants exhibit an attentional bias toward Heart Negative words, as described earlier with respect to Hypothesis one, Furthermore, and in support of the specificity of this effect the participants do not display a consistent attentional bias toward other categories of High-Threat words (Social and Disaster). Indeed, these participants give *less* attention to Social-High Threat and Disaster-High Threat relative to other words. For example, in the Subliminal Condition, NoCVD-HighHFA gave less attention to Social-High Threat than to Heart-High Threat (Difference = -22.0; SE = 4.82; $p < .001$) and Social-High Positive (Difference = -11.7; SE = 5.28; $p < .05$). This group also gave less attention to Disaster-High Threat words than to Heart-High Positive (Difference = -22.5; SE = 6.66; $p < .05$). No significant differences were found in the amount of attention given to Disaster-High Threat and Social-High Threat words.

The CVD-HighHFA participants also gave significantly less attention to Social-High Threat than to Heart-High Positive words (Difference = -9.1; SE = 4.39; $p < .05$). In this group, no significant differences were found in the amount of attention given to Social-High Positive words, nor in the amount of attention given to Disaster-High Threat words compared with Heart-High Positive and Social-High Positive words at the Subliminal level of processing.

A similar pattern of findings emerged in the Supraliminal Presentation condition. The NoCVD-high HFA participants paid significantly less attention to Social-High Threat than to Heart-High Positive (Difference = -18.6; SE = 4.75; $p < .001$) or to Social-High Positive (Difference = -15.1; SE = 4.68; $p < .001$) words. This group also paid significantly less attention to Disaster-High Threat words than to Heart-High Positive (Difference = -17.2; SE = 6.42; $p < .001$) and Social-High Positive (Difference = -13.8; SE = 5.77; $p < .001$) words. Findings for the CVD-HighHFA group indicate that these participants paid significantly less attention to Social-High Threat than to Social-High Positive (Difference = -11.4; SE = 4.26; $p < .01$) words. They also paid less attention to Disaster-High Threat words than to Heart-High Positive (Difference = -11.9; SE = 5.85; p < .001) and Social-High Positive (Difference = -21.5; SE = 5.25; $p < .001$) words. Cumulatively, the findings of the planned comparisons are consistent with the demonstration of a uniform attentional bias towards Heart-High Threat words in HFA participants at both levels of processing as proposed in Hypothesis 3.1. Conversely, the results do not provide evidence for the Vigilance-avoidance Hypothesis for heart-threat words. Overall the evidence suggests that the negative attentional bias of the High HFA groups seems to be specific to heart-relevant words, rather than encompassing all forms of threatening words at both levels of processing.

Hypothesis 3.2: That the negative attentional bias patterns demonstrated towards heart-high threat information by high HFA participants will be significantly greater in the subliminal processing task than the supraliminal processing version of the same task.

This hypothesis proposes that there is a significant three-way Group by Word Type by Presentation interaction. In order to test the significance of this interaction, a repeated measures ANOVA was conducted with two within-subject factors: Word, and Presentation (Subliminal vs. Supraliminal). The three-way interaction between Group, Word and Presentation was statistically significant ($F(19.79, 712.6) = 1.64$; $p < .05$), but the results of post-hoc comparisons between word types are not all consistent with this hypothesis. In accord with the hypothesis, attentional biases toward Heart-High Threat information are greater the subliminal processing task in the CVD-HighHFA participants. Illustratively, in the Subliminal presentation condition, these participants give significantly more attention to the Heart-High Threat than the Heart-Moderate Threat words (Difference = 13.8; SE = 2.59; $p < .001$). By contrast, in the Supraliminal presentation condition, the amount of attention given to the Heart-High Threat and Heart-Moderate Threat does not differ significantly (Difference = 6.3; SE = 3.32; $p > .05$). Similarly, among the NoCVD-HighHFA Participants, attentional biases toward Heart-High Threat information are stronger in the Subliminal than in the Supraliminal presentation condition. Illustratively, in the Subliminal presentation condition, these participants give significantly more attention to Heart-High Threat than to Heart-High Positive words

(Difference = 9.9; SE = 3.54; $p < .001$). By contrast, under Supraliminal presentation, the attention given to Heart-High threat and Heart-High Positive words does not differ significantly (Difference = 6.1; SE = 4.73; $p > .05$).

In contrast, the NoCVD-LowHFA-HTA Participants do not show a significant attentional bias toward Heart-High Threat words in either the Subliminal or the Supraliminal presentation condition. The results pertaining to Hypothesis 3.2 suggest that the effects of HFA on attentional biases can be differentiated from the effects of general trait anxiety. The biases specifically linked to HFA, and not to Trait Anxiety, are more evident at the subliminal level of information processing.

4. The Emotionality Hypothesis

Hypothesis 4.1: Individuals high in HFA will not selectively attend to all emotionally valenced material related to the heart. The attentional bias will be found for heart-related words of a high and moderate threatening nature only (The Threat hypothesis). Since this hypothesis implies that the high HFA groups differ from the three low-HFA groups, the ANOVA results for all five groups, presented earlier, were utilised. The three-way interaction of Group, Word, and Duration was not examined, as the hypothesis only states that the attentional bias will be found in both subliminal and supraliminal conditions, not that the magnitude of the attentional bias will be equivalent under both conditions of presentation.

The results of the planned comparisons are not consistent with this hypothesis. While it is true that high HFA participants give more attention to Heart-High Threat words than they do to other words (as presented under Hypothesis 1.1), they also give significantly more attention to Heart-High Positive Words than to all other words accept those, which are heart related.

Evidence for an attentional bias toward Heart-High Positive words can be found among NoCVD-HighHFA participants. In the Subliminal condition, the NoCVD-HighHFA participants give significantly more attention to Heart-High Positive words than to Social-High Threat (Difference = 22.0; SE = 4.82; $p < .001$), Social-High Positive (Difference = 10.3; SE = 4.62; $p < .001$), Disaster-High Threat (Difference = 22.5; SE = 6.66; $p < .001$), and Neutral (Difference = 16.3; SE = 3.21; $p < .001$) word types. Under Supraliminal presentation conditions, these participants gave greater attention to Heart-High Positive words than to Social-High Threat (Difference = 18.6; SE = 4.75; $p < .001$), Disaster-High Threat (Difference = 17.2; SE = 6.42; $p < .001$), or Neutral (Difference = 12.7; SE = 3.54; $p < .001$) words.

The CVD-HighHFA participants also often gave significantly more attention to Heart-High Positive words. Under Subliminal presentation, these participants gave more attention to Heart-High Positive words than to Social-High Threat (Difference = 9.1; SE = 4.39; $p < .001$), Disaster-High Threat (Difference = 17.3; SE = 6.09; $p < .001$), and Neutral (Difference = 14.0; SE = 2.92; p < .001) words. Under Supraliminal presentation, these participants gave more attention to Heart-High Positive words than to Disaster-High Threat (Difference = 11.9; SE = 5.85; $p < .001$) words, although they gave less attention to Heart-High Positive than they did to Social-High Positive words (Difference = -9.7; SE = 4.18; $p < .001$). Cumulatively, these findings suggest that the attentional biases of high HFA subjects encompass words that have high relevance to the heart, and not only those that specifically refer to a threat to the heart.

5. *The Role of State Anxiety*

Hypothesis 5.1: Those high HFA individuals who are also high in state anxiety will display significantly larger negative attentional bias patterns towards cardiac-related stimuli when compared to high HFA participants low in state anxiety. This hypothesis proposes that the pattern of the two-way HFA by Word interaction, which shows the attentional bias of high HFA individuals, will differ depending on their State Anxiety level. Specifically, State Anxiety is expected to amplify the effects of HFA on negative attentional biases. Thus, this hypothesis preposes a three-way interaction effect between Word, HFA, and State Anxiety. To test this hypothesis, a repeated measures analysis of variance was performed with two between-subject factors (High vs. Low HFA and High vs. Low State Anxiety) and one within-subject factor (Word). Analyses were conducted separately for the Subliminal and Supraliminal conditions. The predicted three-way interaction was not statistically significant with either the Subliminal presentation ($F(3.73, 541.37) = 1.19$; $p > .05$) or the Supraliminal presentation ($F(4.53, 664.18) = 1.34$; $p > .05$).

Hypothesis 5.2: That individuals low in HFA with high state anxiety will display a greater attentional bias towards high threatening cardiac-related words compared to those CVD individuals low in HFA with low state anxiety (in accordance with CMV), which will be more evident at the subliminal level of processing compared to supraliminal. To test this hypothesis, low HFA subjects were divided into high and low State Anxiety groups. The hypothesis proposes a significant two-way interaction between State Anxiety and Word Type, consistent with a greater attentional bias toward high threatening cardiac words, as well as a significant three-way interaction between Anxiety, Word Type, and Duration of Presentation. Consistent with the hypothesis, the two-way State Anxiety by Word interaction was significant ($F(3.70,282.56)$, $p < .01$), as was the three-way State Anxiety by Word by Duration of Presentation ($F(3.4,282.56)$, $p < .001$). However, the results of the planned comparisons provided little support for this hypothesis. In the subliminal condition, high State Anxiety participants did not consistently display a strong negative attentional bias toward Heart-High Threat words. Significant differences were found only between Heart-High Threat and Disaster-High Threat words (Difference = 18.38, SE= 6.71, $p < .01$), as well as between Heart-High Threat and Neutral words (Difference = 13.33, SE = 5.22, $p < .05$).

3. Secondary Analyses

The secondary analyses examined a number of potential confounding factors on the reported results. These include anxiety and depression score during the task, coping style (repression), the age and sex of participant and the severity of the illness in CVD participants. Based on the HFA model (Eifert et al., 2000b) the effect of participant having a family member with CVD was also considered.

In-session Anxiety and Depression Mood-Ratings

Further analyses examined the role of in-session anxiety and depression scores as variables that are possibly confounded with group membership. In order to examine group differences in anxiety and depression, one-way analysis of variance (ANOVA) was employed. Significant group differences were found in Anxiety at Time 1 ($F(4,144) = 4.59$; $p < .01$), Time 2 ($F(4,144) = 4.55$; $p < .01$), and Time 3 ($F(4, 144) = 5.65$; $p < .001$). Planned comparisons, using Tukey's HSD procedure, revealed that the

NoCVD-HighHFA group consistently had significantly higher anxiety scores than the CVD-LowHFA group. Significant differences in Depression were also found at Time 1 ($F(4,144) = 3.02$; $p < .05$) and Time 3 ($F(4,144) = 3.02$; $p < .05$), though not at Time 2 ($F(4,144) = 1.91$; $p > .05$). The planned comparisons of groups revealed that the NoCVD-HighHFA group consistently had significantly higher depression scores than the CVD-Low HFA group. In order to determine whether differential levels of anxiety and depression might account for the attentional biases reported above, the three anxiety and three depression measures were added as covariates in the repeated measures ANOVAs. Covariates were added as a group, rather than one at a time, in order to provide a more stringent standard for determining whether the Word by Group effects remained significant, even after partialling out the effects of depression and anxiety. By entering measurements from all three time points together, variance associated with any one of the measurement points is considered. Significant effects were found for each of the individual Anxiety and Depressions covariates. Nonetheless, in the Subliminal condition, the two-way Word by Group interaction was significant ($F(13.87, 478.61)$, $p < .001$) even when depression and anxiety were included in the model. In the Supraliminal condition, the two-way Word by Group interaction was also significant ($F(17.981, 620.35)$, $p < .001$) even when depression and anxiety were included in the model.

The Role of Repression

A repressive style of coping may influence the pattern of attentional bias displayed in self-reported low anxious individuals (e.g., Eysenck, 1997; Mogg et al., 2000a) and thus confound the interpretation of the presented data. As discussed earlier, the number of repressors was significantly different between the five experimental groups. Thus it was important to test if this affected the patterns of attentional bias reported in this study. In anticipation of such a difference is was hypothesised that individuals categorised high in repression (self-reporting low anxiety and high social desirability) would display a significantly greater attentional bias away from threatening information than the true low anxious participants who did not score high in repression.

To test this, a repeated measures ANOVA was conducted in which Repression was included as an additional between-subject factor, along with Group. Consistent with this hypothesis, the three-way interaction between repression, group and word type is significant ($F(7.29, 17.01) = 1.89$; $p < .05$), suggesting that the attentional biases of different groups vary as a function of repression. However, the effects of repression do not account for the group differences in attentional biases reported above. The two-way group by word type interaction remains significant ($F(9.72, 17.01) = 5.5$; $p < .001$), even after controlling statistically for the effects of repression and its two- and three-way interaction effects.

The Role of Age

As discussed in subsection one, no significant differences in age were found between the five groups. So age cannot account for any main effects of the attentional bias index scores, but a further potential effect of age merits consideration. It might, for example moderate the strength of attentional bias specifically in participants with an older age. To test this potential moderating effect, secondary analyses examined the significance of the three-way interaction between word type, group, and age. Age was treated as a continuous variable within a General Linear Model analysis in order to retain information that would be lost if participants were classified into discrete age levels. To test the moderating effects of age, the interaction effects of age was examined in the context of the repeated measures ANOVA. Specifically, to the extent that age exerts a moderating influence on the Group by Word interaction effect, then the three-way Age by Group by Word interaction should be statistically significant. This three-way interaction would be of particular interest if it showed that the negative attentional biases of high HFA participants varied with age. However, the three way interaction of age, group, and word-type was not significant either in the Subliminal (F (14.02, 228.7) = 0.94; $p > .05$) or the Supraliminal condition (F(11.83, 283.8) = 1.2; $p > .05$).

The Role of Sex

Participant sex was associated with between-subject factor difference (X2(4, N = 10.72; p =.03). A larger proportion of the NoCVD-LowHFA, and the CVD-HighHFA groups were male. In order to determine whether gender differences might account for the attentional biases reported above, gender was added as an additional between-subjects factor in the repeated measures ANOVAs. In both the Subliminal condition, (F(14.02, 487.02), $p < .001$) and the Supraliminal condition, the two-way Word by Group interaction was significant (F(18.21, 632.83), $p < .001$) even when gender was included in the model.

The Effect of Severity of Illness

High levels of illness severity might lead to an increase in attentional bias towards heart-threat words. As discussed earlier, the symptom severity was significantly higher in the CVD-HighHFA than in the CVD-LowHFA group. In order to address this possible confound, severity was added as a between-subject factor in 2 x 5 x 7 repeated measures ANOVAs reported above. In this model, neither the main effects nor the interaction effects of severity were significant. The two-way interaction of group by word type, on the other hand, remained significant in both the Subliminal (F (14.02, 476.68), $p < .001$) and the Supraliminal (F(17.32, 588.92), $p < .001$) conditions (the three-way interaction of Group by Word by Duration also remained significant). These findings suggest that differences in symptom severity do not account for the group differences in attentional bias reported above.

Family Member with CVD

Individuals with a family member with a history of CVD might display higher levels of HFA, and a larger attentional bias towards threatening cardiac-related information. However, the proportion of participants who had a family member with CVD did not differ significantly between the five CVD / HFA groups (X^2 (4) = 0.923; $p > .05$). Therefore, having a family member with CVD is not confounded with membership in these groups.

Chapter 13

Discussion

The current empirical study aimed to examine whether HFA is associated with an attentional bias towards schema-congruent information consistent with current theories of anxiety (Beck & Clark, 1997; Mogg et al., 2000b; Williams et al., 1988, 1997). Specifically, the study's results were intended to provide empirical evidence for Eifert et al.'s (2000b) model of HFA by contributing to the body of empirical work indicative of a negative attentional bias toward heart-threatening information in individuals with high HFA. In doing so, evidence was sought to test the notion that the same underlying cognitive mechanisms contribute to the poor biopsychosocial outcomes reported in both CVD and NOCP patients (e.g., Barsky, 2001; Eifert et al., 1996; Frasure-Smith & Lesperance, 2008; Shen, 2008; Suls & Bunde, 2005). Further, the study aimed to provide additional empirically backed information regarding mediating factors affecting attentional bias in the HFA population. This research utilised a visual-probe task (MacLeod et al., 19986) to assess attentional allocation for a variety of word-based stimuli at the subliminal and supraliminal level of information processing in participants high or low in HFA, with or without CVD. Overall, the results obtained support the presence of a content-specific negative attentional bias towards cardiac-related threatening material in high HFA individuals either with or without CVD, which operates at both levels of information processing. Interestingly, a similar attentional bias pattern was also documented in CVD participants with low HFA. These patterns can be contrasted with the attentional allocation of the healthy control (NoCVD-LowHFA) and HTA (NoCVD-LowHFA-HTA) groups, who did not display this pattern. The specific experimental hypotheses set out in chapter ten are now considered in turn.

The Content-Specificity Hypothesis

Hypothesis 1.1

A content-specific attentional bias towards internal and external threatening heart-related information is theoretically central to the model of HFA (Eifert, et al., 1996; Ratcliffe et al., 2006; Zvolensky et al., 2008) and hence was a major area of interest in the current study. Therefore, the first hypothesis proposed that high HFA participants, either with or without CVD, would display a significantly greater attentional bias toward Heart-High Threat information than low HFA participants without CVD (healthy controls), who would in fact direct attention away from such information. Further, it was predicted that High-Trait anxious individuals (NoCVD-LowHFA-HTA) would display a significant attentional bias towards all high threat stimulus (would not display content-specificity). The data provides partial support for Hypothesis 1.1, in that all groups performed as predicted except for the HTA group, who in some cases did not display a negative attentional bias towards threatening information as predicted. However, when the results are considered as a whole the data provides evidence for the presence of content-specificity in the high HFA groups. Each groups' attentional bias patterns towards Heart-High Threat information relative to other stimulus words types will now be discussed in the context of the current literature and theory.

In line with Eifert et al.'s (2000b) HFA model, at the subliminal level of information processing individuals high in HFA regardless of their organic pathology paid significantly more attention to Heart-High Threat words than any other word type (High-Threat, Heart-Moderate or High-Positive). Of particular importance is that individuals high in HFA directed attention significantly more towards Heart-High Threat than to any other high-threat word type (Social or Disaster). This is supportive of the presence of a schema-congruent attentional bias towards personal concerns and not threat of a general nature. No study to date has examined attentional bias and subliminal processing in a HFA population so this is the first demonstration of attentional bias towards threat-congruent stimuli in HFA participants and corresponds with past research findings of content-specific attentional biases towards panic-related words in patients with Panic Disorder at the subliminal level of processing (e.g., Lundh et al., 1999).

Similarly, in the supraliminal presentation condition, high HFA participants, regardless of organic pathology gave significantly more attention to the Heart-High Threat words when compared to any other high-threat word type (Social or Disaster). This is again supportive of a schema-congruent attentional bias, and is consistent with research reporting content-specificity in Panic Disorder patients at the supraliminal level of processing (e.g., Asmundson et al., 1992; Carter et al., 1992). These results represent the first empirical demonstration of cardiac-related negative attentional bias in HFA at the supraliminal level. However, at the supraliminal level there were some variations in the information processing patterns displayed between the CVD and non-CVD high HFA groups.

At the supraliminal level, individuals with CVD paid a similar amount of attention to Heart-Moderate Threat words as they did to Heart-High Threat word types. It is possible that this result may be a product of the CVD participants' attempts to decrease the preferential processing of highly threatening information through the application of conscious and effortful means, commonly associated with supraliminal processing (MacLeod & Rutherford, 1992; Mathews & MacLeod, 1994). This interpretation of the data is supported by the observed decrease in the attentional bias index score towards Heart-High Threat (and to a lesser extent Heart-Moderate) words at the supraliminal level of processing in the CVD group. The decease logically leads to a reduction in the mean difference between Heart-High and Heart-Moderate Threat words. The interpretation is consistent with a body of research that suggests that non-clinical individuals exposed to personally relevant fear stimuli will attempt to manage the ensuing state anxiety by directing their attentional resources away from the threatening information when conscious strategies are available to them (e.g., Mogg et al., 2004). It is further proposed that cognitive elaboration of the Heart-Moderate words is likely to have occurred at this level of processing, resulting in increased state anxiety on exposure to these words and therefore increased attentional vigilance. Thus the elaboration and higher evaluative processing associated with the supraliminal level is proposed to have increased the subjective "threat" value of the Heart-Moderate words to a similar level as the Heart-High Threat word types. This did not occur in the subliminal presentation because previous research indicates that detailed semantic processing is not present at this processing level (Beck & Clark, 1997; Ohman, 1997).

It is hypothesised that this pattern did not occur at a significant level in the non-CVD group due to a proposed difference in the CVD illness representations held by the two high HFA groups drawn on in the elaboration and evaluation of the experimental stimulus (Cioffi, 1991; Leventhal et al., 1997). Based on the elevated CAQ scores (Eifert et al., 2000a) it is highly probable that both groups have an illness schema regarding the heart as faulty, but the CVD group may hold a more elaborate and sophisticated illness representation in terms of medical knowledge and experiences. This is because the formation of an illness representation is in part moderated by past personal experiences (e.g., Cioffi, 1991; Eifert, 1992; Leventhal et al., 1997) of which CVD patients almost certainly have had more cardiac-related medical experiences (e.g., hospitalisation, medical procedures, testing, rehabilitation etc). If this is true, at the supraliminal level further semantic processing and evaluation of the Heart-Moderate words through the application of the individual's illness representations may result in an increased attention to and difficulty in disengagement with the personally relevant words relative to other types of words. This proposed difference in illness representation may also be questioned because research indicates that the NoCVD-HighHFA individuals are associated with over-use of medical facilities, including unnecessary and repeated testing for heart malfunction (Aikens et al., 2001; Barsky, 2001; Eifert et al., 2000b; Zvolensky et al., 2008) and may also have an extensive and detailed CVD illness representation. Future research to determine if differences in illness representations exist and can account for variations in attentional bias patterns in this population would be helpful.

Alternatively, Dijksterhuis and Smith (2002) provide a methodological explanation for the observed results. In the current experimental design, participants first competed the subliminal trial (containing cardiac-related stimulus) followed by the supraliminal trial. It is possible that this may have led to habituation to the high-threat stimulus resulting in a reduction in participant anxiety and thus reduced attentional bias scores on the supraliminal trials towards Heart-High Threat word types. This is turn would lead to a reduction in the gap between Heart-High threat and Heart-Moderate word types. Indeed research indicates that information processed at a subliminal level can affect subsequent cognitive processes (Kouider & Dehaene, 2007). This does not however explain why this finding was not recorded in the non-CVD experimental group and therefore renders this explanation inadequate to explain why only the CVD group paid a similar amount of attention to Heart-Moderate versus High threat words at the supraliminal level of processing.

In contrast, and similar to the subliminal condition results, High-HFA individuals without CVD attended to Heart-High Threat information significantly more than to any other threat stimuli at the supraliminal level of processing. These results again provide evidence for a content-specific attentional bias. Interestingly, at this processing level non-CVD participants' attention was also attracted towards both categories of High-Positive words (Heart and Social) at a similar level as the Heart-High Threat word types. This finding provides partial support for the Emotionality hypothesis (Martin et al., 1991) that suggests that attention, may be directed towards all emotionally valenced information in individuals with elevated anxiety; however the results do not match this in full because attention was directed away from the non-cardiac High-Threat stimulus words (discussed in detail under Hypothesis 4.1). The finding of an attentional bias toward High-Positive stimuli (Heart and Social) is best explained by the literature demonstrating that, unlike younger populations, elderly individuals are more accustomed to changes in their health status due to the aging process and have typically developed cognitive techniques to cope with compromised health (Leventhal & Crouch, 1997), and may habitually direct their attention away from threatening and towards positive information as a mechanism to manage negative affect, particularly at the supraliminal level of processing (Erskine et al., 2007). For example Mather and Carstensen (2003) demonstrated that older adults (62-94 years) were significantly faster to respond to a dot-probe presented after happy faces rather than sad or angry faces, indicating that the participants had an increased tendency to attend to the happy as opposed to negative faces. This pattern was not replicated with younger adults (18-35 years). The mean attentional bias index scores for positive stimuli indicate that all high HFA participants in the current study may have adopted a strategy of attending to positive stimuli at both levels of information processing. This tendency is more evident at the supraliminal level due to a reduction in the attentional bias index score for the Heart-High Threat word types and is probably related to the tendency for individuals to attempt to direct attention away from threatening information at this level of processing as discussed above. In the non-CVD group this reduction renders the mean difference between Heart-High Threat and Positive words insignificant. The current findings however are not entirely consistent with Mather and Carstensen's (2003) work because their results report a bias away from negative stimuli in their elderly sample. It is suggested that this discrepancy in findings is related to the difference in the composition of the experimental groups. Mather and Carstensen's (2003) sample was composed of healthier participants than the present one, who did not have CVD or high HFA. Given that the attentional bias displayed in the current research is condition-specific it is reasoned that the personalised and specific fears regarding the heart may be over-riding the general cognitive processing strategies employed by elderly populations (e.g., directing away from negative information), but remains operational when participants are faced with less personally relevant threat-related information (e.g., Social and Disaster), evidenced by the reduced attention paid towards the non-cardiac threatening word types.

Although overall the patterns shown by the two high HFA groups is more similar than dissimilar, the variation in attentional patterns at the supraliminal level are likely to be related to the diagnosis of CVD. This is because they cannot be due to differences in HFA scores because they were established as equivalent in the preliminary analysis. Nor can higher trait anxiety levels in CVD participants account for the findings because the preliminary analysis shows that the NoCVD-HighHFA group were significantly higher in trait anxiety than the CVD group, so they might be predicted to have more difficulty in utilising over-ride strategies.

The pattern of bias demonstrated in high HFA individuals with or without CVD can be contrasted with the attentional patterns displayed by the healthy controls in this study (NoCVD-LowHFA). Consistent with the hypothesis, in both the subliminal and the supraliminal conditions, the healthy controls directed significantly less attention towards Heart-High Threat words than they did to Moderate and Positive words. Further and as predicted by the literature, the results indicated that the controls tended to direct their attentional resources away from all threatening information, displaying no significant differences in attentional direction and strength between the Heart-High Threat words and Social-High Threat and Disaster-High Threat word types in either the Subliminal or the Supraliminal conditions. This finding replicates MacLeod et al.'s (1986) findings that LTA controls tended to avoid social and physical threat words presented at the supraliminal level (500ms). Therefore these findings correspond to the predictions made by the BADA (Williams et al., 1988, 1997), which predicts that LTA individuals will direct attention away from threat unlike those with HTA who direct their attention towards the threat. The current findings also correspond to Mogg et al.'s (1992) replication study that found an attentional bias away from threatening information in LTA individuals. However, that group of researchers proposed an alternative explanation for their findings, suggesting that when these types of results are recorded with LTA individuals, the level of fear evoked by the "threat" stimulus may not be strong enough to elicit a threat label (Mogg et al., 2000b). This therefore does not preclude LTA individuals from displaying a negative attentional bias to sufficiently threatening information and hence a conclusion regarding the consistency of this effect towards all threat-information in LTA individuals cannot be drawn and is beyond the scope of this study.

Finally, the noCVD-lowHFA-HTA group was included in the experimental design to enable the comparison of attentional processing patterns of individuals with a general level of high anxiety to individuals with a specific Heart-Focused anxiety. This HTA group responded quite differently to the word stimuli from the healthy control and the high HFA experimental groups. On the whole this group did not display significantly different levels of attentional bias at either the subliminal or the supraliminal level towards negative or positive threat words in comparison to heart-high threat words. Although it was predicted that there would be a non-significant difference in this group's mean difference between high-threat information (i.e., attention would be captured by all negative word types at a similar level), the more general non-significant differences between high-positive and high-threat word types were not predicted. The findings, while not clear-cut, suggest that in some cases the attentional resources of the HTA participants were drawn similarly towards positive words and the high threat word types. These findings are in part consistent with the Emotionality hypothesis (Martin et al., 1991). Further, as noted before, this tendency to attend to positive information may be characteristic of the older population engaged in the current study (Mather & Carstensen, 2003).

In the HTA group and contrary to Mather and Carstensen's (2003) observations of an attentional bias away from threat in an older population, the results also provide some evidence of preferential processing of Social-High Threat words relative to other word types at the subliminal level of processing. This can be contrasted with the healthy controls' and other experimental groups' tendency to direct away from Social-High Threat stimulus. Consistent with this pattern of attentional allocation, at the subliminal level Mogg et al. (1994) found a negative attentional bias in HTA individuals towards achievement threat words, not observed in LTA individuals, but unlike the current study an attentional bias towards physical threat words was also reported. However, it may be that the heart-specific nature of the current study's "physical threat" stimuli was less relevant to HTA individuals who reported no history of heart-related illness or CVD concern as evidenced by their low CAQ (Eifert et al., 2000a) scores.

A number of previous studies have demonstrated a trait anxiety-related bias towards social threat stimuli presented at supraliminal levels of processing (500ms) (e.g., Broadbent & Broadbent). In the present experiment, however this preferential processing of Social-High Threat information relative to other words was not replicated. These findings in part correspond with Bradley et al.'s (1998) investigation of attentional bias in HTA and LTA individuals using the dot-probe task. Although some caution must be taken when comparing the present study with Bradley et al.'s

(1998) research, which presented emotional faces as opposed to word-based stimuli, they reported that HTA compared to LTA individuals were more vigilant to threat and more avoidant of happy faces at the shorter exposure time, but the two groups did not differ significantly in bias scores for threat or happy faces presented at 1250ms. Consistent with Bradley et al. (1998) the present data provides evidence to suggest that vigilance in HTA may be robust at shorter stimulus durations, but the tendency to maintain attention towards threat may diminish and not be present over longer periods of time. To explain this pattern of findings, Luecken et al. (2004) suggest that participants may use strategic coping strategies to manage uncomfortable emotional reactions at the supraliminal level of processing. This proposition is supported by a substantial body of research demonstrating avoidance of threatening information in non-clinical HTA populations when exposed to threat information at the supraliminal level (Mathews, 1990; Mathews & Wells, 2000; Williams et al., 1988). When the current HTA groups' response at the supraliminal level to Social-High Threat words is considered in conjunction with their response to Disaster-High Threat words, the pattern of results provides some evidence for this interpretation. The participants appear to be utilising conscious strategies to direct attention away from Disaster-High Threat words relative to other words types. Further, the preferential processing of Social-High Threat words relative to other words was not present at the supraliminal level of processing, in contrast with its presence in the subliminal condition. It is also possible that the reduced avoidance of the Social-High Threat words relative to other words was due to a lack of elevated high state anxiety. Similar to Luecken et al. (2004), Mogg and Bradley (2004) have suggested that studies failing to find avoidance patterns in non-clinical populations at the supraliminal level may be related to stimuli that do not increase state anxiety sufficiently. This explanation is plausible in the current study because the HTA group's mean trait anxiety score on the STAI (Spielberger et al., 1983) was 34.4, which is an average level of state anxiety for normal working adults (Colt, Powers, & Shanks, 1999; Spielberger et al., 1983). Therefore state anxiety in the HTA participants was not particularly high. The trait anxiety scores of the HTA group suggest that under threat the participants would display higher than average levels of state anxiety (Spielberger et al., 1983). It is suggested that the introduction/rapport building phase of the experimental procedure designed to relax the participant in conjunction with the repetitive nature of the task led to the "lowered" state anxiety displayed.

Although there are several intriguing findings in the HTA group's attentional bias patterns, for the purpose of this study, in can be concluded that these patterns are generally in accordance with the previous literature on HTA and demonstrate that HTA individuals display a different and less strongly schema-specific pattern of attentional bias when compared to the high HFA groups. This pattern provides evidence to support the proposition that HFA is a discrete and specific clinical anxiety disorder, distinguished by a dominant concern regarding the heart's health as evidenced by the unique attentional bias pattern displayed by the high HFA participants.

The overall findings presented under Hypothesis 1.1 correspond with the empirical evidence indicating that anxious individuals display attentional biases to threat stimulus specific to their diagnosed clinical anxiety condition (i.e., Mathews & MacLeod, 1994; Ruiz-Caballero, & Bermundez, 1997; Woody et al., 1998). More specifically, the results are consistent with the research findings reporting a selective bias towards health-threat related stimuli in health anxious (e.g., Mathews &

MacLeod, 1985; Mogg et al., 1989; Owens et al., 2004) when compared to healthy controls.

Moreover, past research examining the attentional bias patterns in populations with physical illness may aid in understanding the current patterns displayed by the CVD-HighHFA group. Particular to CVD, Constans et al. (1999) examined attentional bias to cardiac related words in participants who had recently experienced a MI. Contrary to the present findings, the results indicated that despite the post-MI group having higher levels of heart-related worry and emotional distress when compared to the control group, post-MI patients did not show an attentional bias towards cardiac-threat information presented at 500ms. It should be noted in making a comparison between Constans et al., (1999) study and the present one, that although 500ms is regarded as being at the supraliminal level of processing and therefore can be compared with the current studies supraliminal condition, it is a shorter duration than adopted in the present study (1000ms) and caution must be taken in a direct comparison. Further, it is suggested that because the group in Constans et al.'s (1999) study was not preselected on the basis of elevated anxiety or psychopathology, it was unlikely to be a truly heart-anxious group. Nonetheless, in line with the current results Constans et al. (1999) also found that a self-reported tendency to monitor cardiac threat information was associated with attentional bias towards cardiac-related words in patients with heart disease. Such participants would be more similar to the current HFA population examined in this study because self-reported high vigilance is one of the three sub-scales of the CAQ (Eifert et al., 2000a) used to define HFA in the current research. Nevertheless caution in any direct comparison between the results is recommended and further reinforced due to the considerable differences in the average duration of the CVD diagnosis between the studies (6 months in Constans et al.'s (1999) study and 6.1 years in the current research). This difference is important because research indicates that illness representations and schemas evolve over time (Leventhal et al., 1997). Thus the current CVD experimental group had significantly longer experience of the illness and its implications, and as a result it is highly probable that the groups also held differing illness representations of CVD in terms of the five components (i.e., label, cause, consequences, timeline, cure) described in Leventhal et al.'s (1997) Self-Regulatory model of health and illness. This is relevant because illness representations have been show to significantly affect information processing in CVD patients (e.g., Henderson et al., 2007) and therefore may have contributed to the difference in results reported between the studies.

In summary, the results discussed under Hypothesis 1.1 provide evidence to support the presence of a content-specific attentional bias towards heart-threat related stimuli in high HFA individuals at both processing levels, regardless of their organic pathology. This can be contrasted with the tendency of healthy controls (NoCVD-LowHFA) to direct their attentional resources away from all threatening information and that of HTA (NoCVD-LowHFA-HTA) participants who displayed a less schema-specific pattern of information processing. The presence of a fear-congruent attentional bias provides evidence to support the existence of a condition-specific schema representing the threat concerns of HFA individuals, as suggested by schema theory (Beck & Clark, 1997; Mogg et al., 1989) and the HFA model (Eifert et al., 2000b). This is important because a bias in attention to heart-related threat may lead to greater preoccupation with heart disease and thus perpetuate feelings of poor health and elevated anxiety (Eifert, 1992; Eifert et al., 2000b; Hou et al., 2008; Warwick & Salkovskis, 1990; Yartz et al., 2005), which encourages the performance of unhelpful illness behaviours (Aikens et al., 1999a; Aikens et al., 1999b; Eifert, 1992; Zvolensky et al., 2008), as described in the HFA model (Eifert 1992; Eifert et al., 2000b, Ratcliffe et a., 2006). Consequently this may lead to poor biopsychosocial outcomes for patients displaying this pattern of attentional bias. Finally, the overall similarity in the two high HFA groups' attentional patterns provides empirical support for the proposal that the underlying cognitive mechanisms leading to the poor biopsychosocial outcomes documented in both CVD and NOCP patients with elevated anxiety are in part linked to a specific heart-related illness representation and attentional processing pattern which is shared in HFA patients regardless of organic pathology.

Hypothesis 1.2

Adding further to the empirical understanding of how CVD, anxiety and cognitive processing interact, Hypothesis 1.2 aimed to explore how a diagnosis of CVD would affect attentional processes in the absence of HFA. In support of the proposed hypothesis it was found that the CVD-LowHFA group displayed more attention to the Heart-High Threat words and Heart-Moderate threat words than to other words at both the subliminal and supraliminal level of processing, displaying similar attentional patterns to participants with high HFA. The results revealed that at both the Subliminal and Supraliminal condition, significantly more attention was given to the Heart-High Threat and Heart-Moderate Threat words than the Social-High Threat or the Disaster-High Threat words, and as predicted this group directed their attentional resources away from all other threatening information (Social and

Disaster). These results indicate the presence of concern-specific attentional bias towards cardiac information. Further CVD patients with low HFA attended towards positive stimuli (Heart and Social) at a similar level to how they did to Heart-High Threat information at both levels of processing.

The significant attentional bias towards threat however does not correspond to the results of the single previously published study that examined CVD patients and attentional bias. Constans et al. (1999) examined attentional bias in post-MI patients and found no evidence for attentional bias towards or away from heart-related information at a 500ms presentation time. However, as mentioned under Hypothesis 1.1 it is important to apply caution when comparing the two studies due to the differences in illness duration and in exposure time used in the two studies.

The current results do however correspond to empirical work using the dot-probe task at 500ms with older Chronic Obstructive Pulmonary Disease patients without a history of panic attack or diagnosis of Panic Disorder. That population also demonstrated an attentional bias towards threatening physical information despite the absence of heightened anxiety. They did not however preferentially attend to physically positive words as seen in the current study (Livermore et al., 2007). The authors suggest that exposure to self-relevant information for non-anxious chronically ill patients may lead to preferential processing of threat information, potentially as an adaptive measure in managing the illness. Several other authors also support this explanation (Cioffi, 1991; Leventhal & Crouch, 1997). Indeed it is suggested that a degree of panic/fear regarding cardiac symptoms may be adaptive in CVD patients. The current Australian Heart Foundation management guidelines for

CVD patients encourage awareness of the signs and symptoms of MI and encourage a prompt response in seeking medical input if these symptoms are experienced (Australian Heart Foundation, 2009). Therefore some elevated vigilance towards cardiac input relative to healthy controls would seem adaptive and useful. Moreover, if this bias is also found to be specific to the particular medically verified illness (i.e., the patient does not direct attention towards all threat) and the bias is found in conjunction with a preference for processing positive information also (as found in the current CVD-LowHFA group) it is concluded that the presence of the attentional bias towards cardiac information may be understood as adaptive and appropriate. No study to date has examined CVD patient processing patterns at the subliminal level and this finding is the first to report preferential processing of both negative and positive heart-related information at this level in CVD participants with low anxiety.

The presence of the attentional bias towards positive information (Social & Heart) at both levels of processing contradicts past research that suggests that a bias towards positive information is primarily linked to supraliminal processing (e.g., Mogg et al., 1993, Ruiz-Caballero & Bermudez, 1991). The bias at the subliminal level suggests that it occurred outside of conscious awareness and may be related to unconscious strategies associated with a repressive coping style. The high percentage of repressive copers recorded in this studies CVD-LowHFA group provides evidence for this interpretation (26.5%). However when repression was considered as a covariate in the model, it did not change the outcome and therefore does not account for the results obtained. It is also possible that these results occurred because the subliminal condition was not outside of the participant's awareness as intended. This however is unlikely given that the check following the subliminal presentation trial indicated no awareness of the words. In interpreting the findings considered under Hypothesis 1.2 it is concluded that they are best accounted for by the reported findings of an increased attentional bias towards positive stimuli in elderly populations (Erskine et al., 2007; Mather & Carstensen, 2003) as discussed above. This is the best fit because the bias towards positive information in this study is recorded for both types of positive stimuli, and is thus contradictory to a number of studies indicating that relevance to the current concern of the participant is required to elicit a bias towards positive information (e.g., Mathews & Klug, 1993; Rienmann & McNally, 1995), the results are also inconsistent with the Emotionality hypothesis (Martin et al., 1991) which would predict attendance towards all emotional information, including the other non-cardiac threat words. However the use of Mather and Carstensen's (2003) results to interpret the current ones obtained at the subliminal level needs to be cautious because Mather and Carstensen's (2003) data were obtained only at the supraliminal processing level and in participants selected as normal and healthy.

In summary, the results addressing Hypothesis 1.2 suggest that attentional bias towards heart-related threat is not exclusive to individuals with elevated HFA and may be an adaptive measure in individuals with CVD, who use this information to manage their illness. Additionally, this group may mitigate negative affect through directing attention away from non-relevant threat words and the selective processing of positive information. These findings also provide useful information to further understand how elevated HFA may affect CVD patients, as it suggests that both elevated anxiety regarding the heart and a diagnostic label of CVD may play a role in the deployment of attentional resources towards heart-threat information.

Hypothesis 1.3

To provide further evidence for content-specificity in HFA-based attentional biases, the attentional bias patterns of the non-CVD experimental groups (HighHFA and LowHFA-HTA) were compared when presented with heart-related stimuli. Hypothesis 1.3's prediction that HFA participants would attend more closely to Heart-related stimuli than other words when compared to the HTA participants was supported at the subliminal level of processing, but not at the supraliminal level. In this condition HFA individuals paid more attention to Heart-High Threat words than any others, which was not found for the HTA group, who only paid more attention to Heart-High threat words in comparison to the Neutral words. Similarly, HFA individuals paid more attention to Heart-High Positive words than most others, which was not found for the HTA group, who only paid more attention to Heart-High Positive words in comparison to the Neutral words. The groups did not differ significantly in their attentional allocation for the Heart-Moderate Threat words.

Again the results considered under Hypothesis 1.3 provide evidence that HFA is characterised by a content-specific attentional bias, and can be differentiated from individuals with high levels of trait anxiety based on their attentional bias patterns. Further, the results are consistent with the general theoretical models of anxiety, which propose that anxiety-based attentional biases are more marked at the subliminal level of processing (i.e., CMV, Mogg et al., 2000b; BADA, Williams et al., 1988, 1997). Moreover, subliminal processes are particularly relevant to the current research due to a growing body of research, which suggests that the majority of illness-related self-regulatory behaviour operates outside of conscious awareness (Baragh & Chartrans, 2000; Leventhal et al., 1997).

On the other hand, a number of studies indicate that content-specificity is more evident supraliminally, because schematic processing is more elaborate at this level (e.g., Asmundson et al., 1992; Bradley et al., 1995; Carter et al., 1992; MacLeod & Rutherford, 1992). Based on these findings it might be predicted that the mean difference between attentional bias scores for heart-related words versus other types of words would be greater at the supraliminal level of processing for high HFA participants and thus significantly greater than for the HTA group at this level. However the results considered under Hypothesis 1.1 indicate that at the supraliminal level NoCVD-HighHFA group also begin to preferentially process positive information at a similar level to Heart-High Threat words. The change in processing patterns in the HFA participants, results in similar mean difference scores between heart-related and other word-types for both the HFA and HTA groups at the supraliminal level. As discussed, the HFA group's pattern is suggestive of conscious emotional regulation strategies at the supraliminal level, by which threat words are paid less attention and positive words are paid more attention.

In summary, the results of Hypothesis 1.3 lend further support to the Content-specificity Hypothesis in HFA because the attentional biases recorded for the HFA group were larger for Heart-Threat related words than other words when compared to the HTA group's responses, who did not display a preferential attention to high positive and threat heart-related words at the subliminal level of processing. The results at the supraliminal level indicate a non-significant difference between the

HFA and HTA groups' processing patterns, but this is likely to reflect a change in processing priorities for the HFA individuals, by which attention is directed at the supraliminal level to all positively valenced information at a similar level to the Heart-High Threat words as discussed under Hypothesis 1.1.

Hypothesis 1.4

To help explore the potential processing differences in the High HFA experimental groups, Hypothesis 1.4 considered the pattern of the attentional biases displayed between the CVD and non-CVD groups. In Hypothesis 1.4, it was predicted that of the high HFA groups, the CVD group would display a greater attentional bias than the non-CVD group towards Heart-High Threat words compared to other words. The results however did not support the hypothesis; overall the data recorded at both levels of processing provides evidence more consistent with the proposition that the underlying cognitive mechanisms (attentional biases) are similar for both groups. This is because in the subliminal condition the pattern of bias towards Heart-related stimulus was similar for both groups and no significant difference between the groups was found in the strength of attentional bias towards schema-congruent threat-words versus other word types. At the supraliminal level the CVD participants displayed significantly more bias towards Heart-High Threat relative to other words when compared to the non-CVD participants, but only for a limited number of word types, providing partial evidence for a difference in the strength of the effect between the two groups at the supraliminal level.

The presence of a significant difference at the supraliminal level, but not at the subliminal level suggests that the level of information processing may be an important factor in differentiating the attentional bias patterns of HFA patients with or without CVD. It is possible that the groups differ in their ability to override automatic threat processing and apply conscious strategies to manage negative emotional states once processing is at the supraliminal level. This interpretation is suggested because the mean attentional bias score was significantly larger for CVD participants in their response to the Heart-High Threat when compared with the Heart-High Positive words; in contrast, the results indicated that non-CVD participants were attending to Heart-High positive words at a similar level to Heart-High Threat words. This difference in attention to positive word types has been discussed under Hypothesis 1.1 and will be continued under Hypothesis 4.1, which deals expressly with the Emotionality hypothesis.

Further discrepancies in attentional bias patterns were found when comparing the mean differences in attention between Heart-High Threat and Disaster-High Threat words in the two groups. The mean difference was larger for the CVD participants. Although a similar pattern of attention towards Heart-High Threat and away from Disaster-High threat was recorded in both groups, the difference in strength suggests that the Heart-High Threat words caused a greater attentional attraction than the Disaster-High threat words for CVD versus the non-CVD participants. Further evidence for this pattern is provided in the mean difference in attention to Heart-High Threat words compared to the Neutral word pairs between the groups. Because the Neutral words theoretically yield a baseline reaction time (as there should be no competition for attention between the two neutral words) a larger mean difference between Heart-High Threat and Neutral words in the two groups suggests that again Heart-High threat is more attention capturing for the CVD group when compared to the non-CVD group.

It is possible that a diagnosis of CVD also contributes to the pattern and strength of attentional bias displayed towards health-threat information. Several studies indicate that health status (e.g., having a medical diagnosis of CVD), not anxiety and depression levels, influences attentional bias towards health-threat information (Fortune et al., 2003; Hou et al., 2008). Because the current findings indicate that HFA is linked to a bias towards heart-threat information in the absence of a CVD diagnosis, the CVD-HighHFA group's results are unlikely to fully replicate the findings of Fortune et al. (2003) and Hou et al. (2008). However, that research, in conjunction with the current results, suggests that illness status plays a role in attentional bias patterns when illness-congruent information is presented. A diagnosis of CVD in HFA individuals may influence the pattern of attentional bias displayed at the supraliminal level of processing and differentiate the CVD patients' processing patterns from non-CVD patients.

Any comparison between the research just cited and the current study, however, should be tentative because the participants in the previous work were not chosen for high anxiety and so may not represent the same degree of psychopathology as the present sample. A body of research with physically ill samples, pre-selected for high levels of psychopathology is required to clarify the role of these factors in attentional deployment patterns.

To explain why a diagnosis of CVD may create differential bias patterns at the supraliminal level of processing only, the effect of illness representations is again considered. This consideration is important because research indicates that an activated illness-schema plays a significant role in negative attentional bias (Lecci & Cohen, 2002, 2007) and in this study may have increased the mean difference between Heart-High Threat words and other word types in the CVD participants. Therefore, as previously discussed, it is probable that the CVD and non-CVD groups hold illness representations of CVD that are different in detail and content. If this is true, at the supraliminal level of processing further semantic processing of the threat words by the application of the individual's illness schemas (not typically seen in subliminal processing, e.g., Kouider & Dehaene, 2007) may result in increased difficulties in disengagement from threat-relevant material relative to other word types in individuals with the more comprehensive illness representations. This hypothesis is in accordance with Schema theory (Beck and Clark, 1997) and other current models of anxiety (Mogg et al., 2000b; Williams et al., 1988, 1997). However, as noted above, it is currently not known whether the two groups' illness representations are meaningfully different, to increase confidence in this interpretation further research is desirable.

Additionally, a related methodological factor may have led to the recorded difference in results in the HFA groups. It is possible that the illness representations of the CVD group were inadvertently primed prior to completing the visual probe task. During experimentation it was informally noted that participants with CVD and high HFA wished to discuss their illness experience before the start of experiment, which was not observed as frequently or at all in the other experimental groups. Although everything was done to avoid this, the processes of CVD participants beginning their "stories" may have cued their illness representations, and may have induced greater attentional bias, particularly at the supraliminal level of processing. This problem is difficult to address in such studies because standard instructions requesting participants not to discuss their illness experiences could itself cue their illness representation. Research into the effect of priming illness representations upon information processing in this population would aid in clarifying these effects.

In summary, the results discussed under Hypothesis 1.4 indicate that the attentional bias patterns in HFA individuals with or without CVD are more similar than dissimilar. However, some differences at the supraliminal level suggest that CVD participants may be experiencing difficulty in applying strategic emotional management skills at the supraliminal level of processing, when compared to the non-CVD group. It is postulated that a diagnosis of CVD may affect information processing, possibly related to differences in illness representations. More research regarding the illness representations of the HFA population is required.

The Role of Stimulus Threat Level

Hypothesis 2.1

In order to ensure that the empirical data collected regarding the model of HFA was embedded in the wider theoretical literature regarding anxiety, the study also aimed to examine the effect of the stimulus threat level on attentional processing. This was done to determine if the BADA (Williams et al., 1988, 1997) or the CMV (Mogg et al., 2000b) best accounted for high and low HFA participants' attentional bias patterns towards threatening information. To examine this theoretical question the two CVD participant groups were chosen for evaluation. These two groups were selected for comparison due, firstly, to the obvious clinical applications of understanding how individuals with CVD might process differently valenced information as a function of HFA, and secondly to provide a broader context for theoretically understanding HFA by comparing low HFA-associated attentional bias patterns with high HFA-associated attentional bias patterns in CVD patients. Further, the choice of these two groups also addresses a methodological issue often overlooked in attentional bias research examining specificity. Stimulus words are usually selected to target the high anxious group's anxiety source but not that of the low anxious group; in this analysis it was assumed that both groups would have some anxiety about cardiac stimuli (an assumption confirmed through the strong evidence for a schema-specific attentional bias in the low HFA group).

Consequently, it was hypothesised that individuals with CVD and high in HFA would display an attentional bias towards both High and Moderately threatening heart-related information compared to those with low HFA and CVD who would display an attention bias towards Heart-High but not Heart-Moderate threatening information (in accordance with the CMV, Mogg et al., 2000b). Consistent with this hypothesis the results indicate that CVD individuals with high HFA generally gave more attention to Heart-High and Heart-Moderate Threat words than all other word types. Similarly, consistent with the hypothesis, CVD individuals with low HFA also paid significantly more attention to Heart-High Threat stimulus than any other word type, but, contrary to Hypothesis 2.1, the low HFA group also paid significantly more attention to Heart-Moderate words than to other high threat word type (Social or Disaster), indicating that the CVD participants low in HFA direct attention towards information of personal relevance at both high and moderate threat levels.

These results are contrary to the CMV (Mogg et al., 2000b) and the BADA (Williams et al., 1988, 1997). For example, research supporting the BADA (Williams et al., 1988, 1997) has reported that LTA individuals display an attentional bias away from threatening information, in contrast to those with HTA who show bias towards threatening information (e.g., Egloff & Hock , 2001; MacLeod et al., 1986; MacLeod & Rutherford, 1992; Mogg et al., 1992). The current findings are also contrary to pictorially based dot-probe studies supportive of the CMV (Mogg et al., 2000b) which indicated that LTA individuals have a negative attentional bias to highly threatening information but not towards moderate-threat information. This can be contrasted with the LTA participants in this study who attended to both levels of threat (e.g., Koster et al., 2006a; Li et al., 2007; Mogg et al., 2000b; Wilson & MacLeod, 2003). It should be noted, however, that those studies were conducted predominantly with non-clinical populations free of organic illness. As discussed under Hypothesis 1.2, a medically confirmed diagnosis of CVD could affect how individuals low in anxiety attend to and process information.

Based on research in support of the CMV, Wilson and MacLeod (2003) argue that the outcome of attentional deployment studies may be dependent on the specific threat intensity of the stimuli used, so that only when the threat intensity levels fall in the moderate area will the differences in responding between HTA and LTA individuals be observed. It is therefore possible that the current findings reveal no difference between High and Low HFA attentional bias patterns due to the use of overly threatening heart-related stimuli. That is somewhat unlikely, however, given that the stimuli utilised were word-based, which in past research has been criticised for low threat intensity due to ecological invalidity (e.g., Mogg et al., 1999). In addition, the pilot-study in the present research was designed to ensure that a CVD population perceived the words selected as moderately threatening. Nevertheless, further exploration of this hypothesis, employing heart-related information with increased variation in threat (i.e., very mild to very threatening) may be useful in elucidating whether, in keeping with the CMV, CVD patients without HFA required more threatening cardiac-related information to elicit an attentional bias when compared to CVD patients with high HFA.

Furthermore, in both the BADA (Williams et al., 1988 1997) and CMV (Mogg et al., 2000b) the tendency to allocate resources preferentially to threat information in HTA individuals is predicted to increase as state anxiety increases (Egloff &Hock, 2001; Macleod & Rutherford, 1992; Mogg et al., 2000b; Williams et al., 1988, 1997). A significant body of research supports an interaction hypothesis (e.g., Broadbent & Broadbent, 1988; MacLeod & Mathews, 1988). A state anxiety interaction with HFA is absent in the current research but its absence is probably related to insufficient state anxiety. This will be discussed further under Hypotheses 5.1 and 5.2, which deal explicitly with the role of state anxiety in HFA-based attentional biases.

In summary, the data considered under Hypothesis 2.1 suggests that variation in the threat level of Heart-related information does not affect whether an attentional bias towards threatening heart-related information is displayed in CVD participants who are low in HFA, as predicted by the CMV (Mogg et al., 2000b). Rather, these results indicate that personally relevant threat information at both moderate and high levels attracts attention in CVD participants regardless of their HFA status. Furthermore, this effect was not moderated by state anxiety as predicted by the CMV (Mogg et al., 2000b), and the BADA (Williams et al., 1988, 1997). The absence of the predicted interaction is best accounted for by the low levels of state anxiety in the current experimental group.

The Role of Processing Level

Hypothesis 3.1

Research indicates that the timeline of information processing may affect the pattern of attentional bias displayed by individuals high and low in trait and state anxiety (Bar-Haim et al., 2007; Cisler et al., 2009; MacLeod & Rutherford, 1992; Mogg, White, & Millar, 1995; Williams et al., 1996). In addition, it may provide insight into the underlying mechanisms producing attentional bias (Cisler et al., 2009). Consequently, the present study assessed attentional bias at both the subliminal and the supraliminal levels of processing by manipulating the stimulus exposure duration. The subliminal exposure duration (< 100ms) is too short to allow either full scanning of word stimuli or shifts in gaze (the intersaccadic interval during active visual search is 200-300ms; Kowle, 1995) and so this level of processing is likely to reflect automatic initial shifts in attention (facilitated attention) (Cisler et al., 2009). The supraliminal level (1000ms) allowed for shifts in attention and gaze between the paired words and thus was more sensitive to the maintenance of attention and difficulties in disengaging with the stimulus (Cisler et al., 2009).

Consistent with Hypothesis 3.1, a specific attentional bias towards Heart-High Threat related words was found in high HFA participants at both levels of processing. As predicted, support for a vigilance-avoidance pattern of attention was not found in

HFA participants. This is consistent with the theoretical model of HFA as proposed by Eifert et al. (2000b) and research with clinical populations diagnosed with Generalised Anxiety Disorder, Panic Disorder and Obsessive Compulsive Disorder which have recorded a pattern of vigilance at both levels of processing (e.g., Bradley et al., 1995; MacLeod et al., 1986; Mogg et al., 1993a; Mogg & Bradley, 2005; van den Heuvel et al., 2005). Furthermore, because the subliminal presentation condition was delivered first in all trials, supraliminal priming is unlikely to be responsible for the significant attentional bias recorded at the subliminal level of processing as suggested by several researchers who reported that supraliminal priming was necessary to obtain significant negative attentional bias at the subliminal level (e.g., Fox, 1996; Luecken et al., 2004). Thus these results indicate an independent early processing bias in HFA participants. In other words they suggest a HFA-related attentional bias in the form of an initial shift of attention towards briefly presented Heart-High threat stimuli, which is then sustained at the supraliminal level of processing, suggesting additional difficulties in disengagement from the threat stimulus.

These results are interesting, because non-clinical anxious participants commonly display a vigilant-avoidant pattern of attention bias (e.g., Brown et al., 2007; Koster et al., 2004, 2006b; MacLeod & Rutherford, 1992). Given that the experimental sample was divided into high and low HFA groups via a median split procedure, the high HFA group in this study may not represent a clinical level of HFA, and therefore the current results are at odds with findings suggesting that if a threat stimulus is self-relevant strategic avoidance may take place in non-clinical samples. For example, Mogg, et al. (2004) using a pictorial version of the dot-probe task (blood injury, violence and death pictures) for two exposure durations (500ms and 1500ms) found evidence for a vigilance-avoidance pattern of attention in a non-clinical population with a blood-injury fear, but did not find this for the general HTA group, who displayed avoidance at 500ms but no significant bias at the 1500ms presentation time. These results suggest that if the threat is sufficiently self-relevant and fear arousing, strategic avoidance may take place. Researchers who fail to find the vigilance-avoidance pattern of processing in non-clinical groups have attributed this to insufficient stimulus threat and low state anxiety (e.g., Mogg & Bradley, 2004), but those results again are also at odds with the current finding, because these studies report an absence of an attentional bias in either direction when exposed to threat information at the supraliminal level.

The high HFA groups in the current study display a attentional processing response to the Heart-High Threat stimuli that is consistent with clinical population patterns in past research, in which they have displayed vigilance towards threat at both levels of processing (e.g., Bradley et al., 1995; MacLeod et al., 1986; Mogg et al., 1993a; Mogg & Bradley, 2005; van den Heuvel et al., 2005). In clinically anxious populations the presence of attentional bias at both levels of processing has been attributed to an inability to counteract the attentional bias in processing even at the supraliminal level of processing when individuals could be expected to engage consciously mediated cognitive tools (Williams et al., 1997), this may also be so in the current population. It is suggested that although there are some changes in processing patterns in the HFA groups at the supraliminal level, such as the similar attention paid to High Positive and Heart-High Threat word types in the NoCVD-HighHFA group, indicative of strategic emotional management, it appears that high

HFA participants cannot fully disengage attention from the heart-relevant information. Further, participants with CVD may also be acting in an adaptive manner, by attending to personally relevant information regarding a legitimate health condition (although this would depend on their interpretation of these stimuli). The issue of information interpretation is beyond the scope of this study, but would provide an interesting direction for further research.

In summary, the evidence considered under Hypothesis 3.1 indicates that the high HFA participants in this study displayed an anxiety-related attentional bias at the subliminal level of processing indicative of a facilitated initial shift of attention towards briefly presented Heart-High threat stimuli, which was sustained at the supraliminal level of processing and suggests difficulties in disengagement from the threat stimuli also. This response indicates that high HFA participants were not successfully engaging strategic avoidance strategies, as often seen in non-clinical samples and behaved more like a clinical population.

Hypothesis 3.2

Current empirical data suggests that not all aspects of attentional processes may be uniform throughout the timeline of processing (e.g., Bar-Haim et al., 2007), so it was hypothesised, consistent with existing models of anxiety (e.g., Beck & Clark, 1997; Mogg et al., 2000b; Williams et al., 1988, 1997), that the strength of the attentional bias towards Heart-High Threat would be greater in the subliminal condition when compared with the supraliminal condition for participants high in HFA. The results provide evidence to suggest that the attentional bias displayed in high HFA individuals with or without CVD is greater at the subliminal level, and are consistent with a large body of research indicating that the detection of stimulus emotionality is made at the early stages of processing and in the absence of awareness (LeDoux, 1996), and that clinical anxiety (e.g., Mogg et al., 1993a) and HTA (e.g., Bar-Haim, et al., 2007) is more strongly associated with a subliminal bias towards threatening information. The results are consistent to some extent with the CMV (Mogg et al., 2000b) and the BADA (Williams et al., 1988, 997) that suggest that anxiety-related attentional biases primarily occur at the subliminal level of processing.

In summary, the results indicate that the high HFA groups' attentional bias toward Heart-High Threat may be more strongly related to facilitated attention to threatening information than difficulties in disengagement, but the presence of the attentional bias towards Heart-High Threat at the supraliminal level suggests that difficulties in disengagement may also be implicated in the underlying mechanisms leading to attentional bias patterns in high HFA participants.

The Emotionality Hypothesis

Hypothesis 4.1

Given that the HFA theoretical model (Eifert et al., 2000b) is based on the premise that an attentional bias towards *threatening* heart-related information defines the condition, the study aimed to test the Emotionality hypothesis, which predicts that anxious individuals will attend to all emotional information (negative or positive) (Martin et al., 1991). Based on conclusions drawn from the current literature and the theoretical model of HFA (Eifert et al., 2000b) it was predicted that individuals high in HFA would only selectively attend to heart-related words of a threatening nature (as opposed to positive and threatening information). Contrary to this prediction, although, as discussed under Hypothesis 1.1, at the subliminal level of processing, high HFA participants both with and without CVD gave more attention to Heart-High Threat words compared to all other types of words, including Heart-High positive information. HFA participants also gave significantly more attention to Heart-High Positive words than to many other word types that were not related to the heart, providing partial support for the Emotionality hypothesis.

Considering the subliminal processing of the high HFA groups, it is suggested that their attentional bias patterns are inconsistent with the Emotionality hypothesis because, although the participants did attend to Heart-High Positive words preferentially when compared to the neutral word types, the non-heart high-threat word types (Social and Disaster) were not attended to and hence the High HFA groups did not show a generalised bias towards all emotional stimuli. Several studies using both the dot-probe task and modified Stroop methodology have examined for emotionality effects at the subliminal level of processing. Contrary to the current results, no study has reported attentional bias for positive stimuli at the subliminal level of processing in HTA or in clinical populations (e.g., Bradley et al., 1999; Mogg et al., 1994; Mogg et al., 1995). The current findings are at odds with the suggestion by Mogg et al. (1993) and Ruiz-Caballero and Bermundez (1991) that attentional bias towards positive stimuli may be a function of controlled strategies that depend on supraliminal awareness to offset negative mood states. One possible explanation for the current findings is that the subliminal presentation of words was not completely outside of the participant's awareness as intended in the experimental design. Although participants could not read the word pairs presented in the awareness check following the subliminal word presentation, making this unlikely, the design did not employ backward masking, which can be used to ensure that subliminal processes are outside of participant awareness (Kouider & Dehaene, 2007; Ononaiye et al., 2007), so some conscious processing of the subliminal stimulus words may not have been impossible. To increase confidence in these findings, replication with backward masking would be desirable.

Turning to the supraliminal processing in both groups, the results are partly consistent with a bias towards emotionally valenced stimuli (both negative and positive). However, unlike Martin et al.'s (1991) research with Generalized Anxiety Disorder patients using the modified Stroop task at 500ms, the current results did not reveal an attentional bias towards all threatening and positive words consistent with the Emotionality hypothesis. Furthermore, contrary to Martin et al.'s findings, the bias towards the Heart-High Threat words was significantly greater than for positive stimuli. Further, Social-High Positive words were also accorded similar or even greater attention than Heart-High Positive words. This would suggest that, rather than the words receiving attention because they are semantically related to cardiac concern (Mathews & Klug, 1993; Rienmann & McNally, 1995), the findings are probably related to the application of emotional management strategies seen in older populations as discussed above (e.g., Mather & Carstensen, 2003; Mogg et al., 1993; Ruiz-Caballero & Bermundez, 1991).

Finally, more recent research indicates that psychophysiological measures may also be necessary to determine whether positive information receives the same processing priority as threatening information. For example, using a dot-probe task and Event Related Potentials (ERP) in a group of healthy volunteers, Holmes et al. (2009), reported that both happy and angry faces attracted significantly more attention than neutral words, but the ERP data indicated that the negative faces were prioritised for processing when compared with the happy faces. This finding is consistent with the "Threat Hypothesis". It is therefore suggested that further research incorporating ERP methodology would increase the understanding of attentional allocation to emotionally valenced stimuli in HFA.

Before concluding this section a brief mention of the positively valenced heart stimuli employed should be made. As discussed under Appendix C, because the development the physical heart's meaning has been intimately linked with the human life force and various other spiritual/emotional concepts (see Godwin, 2001; Zvolensky et al., 2008 for a review) the positively valenced heart word types employed in the current study were not of a direct bio-medical nature. It is possible then, that these words are not fully equivalent to the negative heart related words in a "Mirror-image" sense, and that could explain why in many of the trials for the high HFA groups and the CVD-LowHFA group the Social and Heart positive words attracted a similar amount of attention. Devising materials to avoid this ambiguity, though, would present a significant challenge.

In summary, although the data considered under Hypothesis 4.1 provided evidence of preferential processing of positive information, the tendency to attend to all emotional information, as proposed under the Emotionality hypothesis (Martin et al., 1991), was not found. Further, the results seem to reflect preferential processing of *all* positive information and do not support a content-specific/relatedness hypothesis, which would predict preferential processing of only the Heart-High Positive information because of its relevance to the high HFA participants' core fear-schema (Mathews & Klug, 1993; Rienmann & McNally, 1995). Rather it is concluded that the current results are the product of an attempt to mitigate negative state affect through the preferential processing of positive information (e.g., Mather & Carstensen, 2003; Mogg et al., 1993; Ruiz-Caballero & Bermundez, 1991).

The Role of State Anxiety

Hypothesis 5.1 and Hypothesis 5.2

Previous research has examined the contribution of state and trait anxiety to ascertain how each might contribute to attentional bias patterns. Although the findings remain contradictory, it is largely accepted, as described by the CMV (Mogg et al., 2000b) and the BADA (Williams et al., 1988, 1997) and supported by empirical data, that an interaction between state and trait anxiety determines attentional processing patterns (e.g., Broadbent & Broadbent, 1988; Egloff & Hock, 2001; Fox, 1996; MacLeod & Mathews, 1988; MacLeod & Rutherford, 1992). To establish whether state anxiety plays a role in HFA-based attentional bias, the effect of state anxiety on HFA-based attentional biases was considered. It was predicted that state anxiety would interact with HFA to increase the strength of the attentional biases displayed. However, the results did not support the hypothesis that high HFA individuals with concurrent high state anxiety would display significantly greater negative attentional bias patterns toward Heart-High Threat when compared to high HFA participants low in state anxiety. Further, the results overall did not support Hypothesis 5.2, which predicted that individuals with CVD but low in HFA, and with high state anxiety, would display a greater attentional bias towards high threatening cardiac-related words compared to those CVD individuals low in HFA with low state anxiety, and this would be more evident at the subliminal than at the supraliminal level of processing. These findings are contrary to a significant body of research, which has reported such an interaction (e.g., MacLeod and Mathews, 1988; Mogg, Bradley, de Bono, & Painter, 1997; Mogg, Bradley, & Hallowell, 1994), and are inconsistent with the BADA (Williams et al., 1988, 1997) and the CMV (Mogg et al., 2000b).

To interpret the current results, the state anxiety scores of the high and low HFA non-CVD and CVD groups should be considered. Comparing the mean state anxiety scores for each current experimental group with past research reporting a significant state by trait interaction using the STAI (Spielberger et al., 1983) to determine state anxiety, it is observed that on the whole the state scores from past research are higher than those seen in the current study. For example Rutherford and MacLeod's (1992) frequently cited study reported an average state anxiety score across the high and low anxiety groups of 39.9. Although the NoCVD-HighHFA group in the present study approaches this score, the three groups' average state anxiety scores do not. Thus, the low level of state anxiety could be a reason for the failure to uphold Hypotheses 5.1 and 5.2. An induction technique like that of Fox (1996) could be useful in ensuring high state anxiety in future research.

Although the results considered under Hypotheses 5.1 and 5.2 were negative, the findings are important in ruling out certain interpretations of how attentional bias operates in a high HFA population. For example, Buckley et al. (2002) failed to find attentional bias at the subliminal level of processing when examining Panic Disorder and PTSD participants. They suggested that this absence of bias was related to low levels of state anxiety and thus low physiological arousal in this population and they proposed that attentional bias in conditions linked to physiological arousal requires the individual to be aroused. Given that the mechanisms underlying HFA are supposedly related to physiological arousal (Barsky, 2001; Eifert, 1992; Eifert et al., 2000b, Ratcliffe et al., 2006) the findings of the current research study in which attentional bias scores were independent of state anxiety are important. This implies that state anxiety and increased physiological arousal may not be a prerequisite for biased processing in HFA individuals. Further, Lecci and Cohen's (2002, 2007) research indicates that primed illness representations (associated with elevated state anxiety) may be required for an attentional bias to be displayed in non-clinical health-concerned individuals. Assuming that illness representations were not inadvertently primed in the current study (unlikely given the low level of state anxiety), deliberate illness representation activation was not necessary to elicit an attentional bias in the present study, and implies that a primed CVD illness representation is not required for HFA participants to display attentionally biased processing of cardiac-related information.

In Summary, the results considered under Hypothesis 5.1 and 5.2 provide no evidence for a state-trait interaction and suggest that negative attentional bias in HFA participants is not dependent on elevated state anxiety. It is further concluded that the absence of interaction effects in the current study is probably related to low state anxiety levels and therefore not conclusive.

An Integration of the findings

In this section the results of the current study will be reviewed as a whole, first considering other factors that might account for the overall pattern of results and concluding with an integrated summary of the findings and their theoretical ramifications for the existing model of HFA.

In looking for alternative explanations for the pattern of attentional bias found among the experimental groups, other potential covariates were considered. Based on the secondary analysis it was concluded that the attentional bias patterns found in this study could not be accounted for by differences in mood during the experiment, because although there were predictable differences between groups in self-reported "happiness and "anxiety", when these measures were entered as covariates, the results remained unaffected. Additionally, published research indicates that a repressive coping style can affect attentional bias index scores (e.g., Eysenck, 1997; Jansson et al., 2005; Mogg et al., 2000a), and repression differed significantly between the groups. Indeed, a significant proportion of those low in measured trait anxiety were categorised as repressors, which is consistent with previous research examining the elderly (Erskine et al., 2007) and individuals with chronic illness (Ayers & Myers, 2008; Cooke et al., 2003). In anticipation of this finding in our current sample it was hypothesised that individuals categorised as high in repression (self-reporting low anxiety and high social desirability) would display a significantly greater attentional bias away from threatening information than the true low anxious participants who did not score high in repression. The three-way interaction between repression, group and word type was significant, suggesting that attentional bias scores do indeed vary as a function of repression. However the effects of repression did not account for the group differences in attentional biases reported above. Although beyond the scope of the present study, these results indicate that CVD and repressive copying style may be an interesting avenue of research to pursue in the future.

When considering the two CVD groups, it was found that the illness severity rating was higher in those with high HFA. This raises the question as to whether the CAQ (Eifert et al., 2000a) used to measure HFA in the current sample also reflected adaptive anxiety or concern regarding the heart (e.g., answering yes to "when I have chest discomfort or when my heart is beating fast I like to be checked out by a doctor"), as discussed earlier under hypothesis 1.2. Nevertheless when illness severity was entered as a covariate for CVD patients the attentional bias patterns were not changed. It is suggested that illness severity may however affect how attended cardiac information is evaluated and elaborated. Experimental evidence reports that in elderly populations the likelihood of attributing symptoms to aging was greater for mild than severe symptoms, and those who attributed symptoms to aging displayed less emotional distress (Prohaska, Keller, Leventhal & Leventhal, 1987). It is possible that attributions regarding CVD symptoms and therefore the participants HFA level is dictated to some extent by the severity of the CVD present.

Age was also considered as a moderator of attentional bias patterns for HFA participants, but proved insignificant. Finally participant sex and having a family history of heart disease were also both found to be unrelated to the patterns of bias displayed in the current study.

Overall, the results of this study provide evidence to support the presence of a content-specific attentional bias towards cardiac-related threat stimuli in high HFA individuals, regardless of their organic pathology at both levels of information processing, consistent with Schema Theory (Beck & Clark, 1997; Mogg et al., 1989) and the HFA model (Eifert et al., 2000b). This provides evidence that HFA is a discrete anxiety disorder pertaining exclusively to the fear of heart-related events, sensations and functioning (Eifert et al., 2000b). In accordance with current cognitive models of anxiety (Mogg et al., 2000b, Williams et al., 1988, 1997) the results obtained indicate that the high HFA group's attentional bias toward Heart-High Threat stimuli may be more strongly related to a facilitated attention to threatening information (subliminal processing) than difficulties in disengagement (supraliminal processing). However, an attentional bias towards heart-threat words recorded at the supraliminal level indicates that difficulties in disengagement may also underlie cardiac-attentional bias in high HFA participants, consistent with Eifert et al.'s (2000b) model of HFA. The attentional bias patterns are more similar between the HFA groups with and without CVD at the subliminal level of processing. The differences in the high HFA group's attentional bias patterns at the supraliminal level seem likely to reflect the CVD individual's difficulty in applying strategic cognitive management skills, an application observed more readily in the non-CVD high HFA group (i.e., a bias towards all positively valenced information). It is postulated that having a diagnosis of CVD may lead to variation in information processing, possibly related to variations in the quality of illness representations held by those with and without CVD.

The results unexpectedly also provide evidence of the preferential processing of *all* positively valenced information in high HFA individuals. Taken together the current results do not provide evidence for the Emotionality hypothesis (Martin et al., 1991), and provide only limited evidence for Heart-High Positive words being preferentially attended to because of their relatedness to cardiac-threat words (Mathews & Klug, 1993; Rienmann & McNally, 1995). The tendency to direct attention toward positive information is not predicted by the HFA model (Eifert et al., 2000b), but is not strictly contradictory, and overall is best explained through the documented tendency for older individuals to manage negative state affect through deployment of attention to positive information (Mather & Carstensen, 2003), as seen at both levels of information processing in the current study.

Considering the data together the attentional bias profile of the high HFA groups was more similar than dissimilar and provides empirical support for the proposal that the underlying cognitive mechanisms leading to the poor biopsychosocial outcomes documented in both CVD and NOCP patients with elevated anxiety are in part linked to a specific heart-related illness schema and attentional processing pattern which is shared in HFA patients regardless of organic pathology.

The results revealed a similar pattern of attentional bias towards heart-threat related words in the CVD-LowHFA group, implying that attentional bias towards heart-related threat is not exclusive to individuals with elevated HFA and may even be an adaptive measure in patients with CVD. These findings suggest that either elevated anxiety regarding the heart (HFA) or a diagnostic label of CVD may play a role in the deployment of attentional resources towards heart-threat information. This finding can be interpreted as complimentary to the model of HFA (Eifert et al., 2000b, Ratcliffe et al., 2006; Zvolensky et al., 2008) as discussed below.

The model of HFA proposes that it is not only selective attention towards negative cardiac information but also the misinterpretation of cardiac information, and inaccurate beliefs regarding the heart that maintain problematic anxiety in high HFA individuals (Eifert, 1992). It is therefore arguable that when compared to the CVD-HighHFA group, the CVD-LowHFA participants are likely to hold a more accurate illness representation, as supported by a low score on the CAQ (Eifert et al., 2000a). The more accurate representation may facilitate the interpretation of the negative information in a realistic and functional manner, enabling this group to utilise the information for appropriate management of their illness as suggested by several theorists (e.g., Cioffi, 1991; Leventhal et al., 1997). This is consistent with a significant body of research indicating that illness representations shape what is understood, encoded and remembered about a given stimulus (Henderson et al., 2007; Leventhal et al., 1997; Martin & Lemos, 2002; Petrie et al., 2002), implying that differences in illness representations have the potential to affect how stimuli are emotionally and behaviourally responded to (e.g., Petrie et al., 2002; Weinman et al., 2000; Yartz et al., 2005). Consequently the interpretation of cardiac information is also central to the development and maintenance of HFA. This idea is supported by previous research undertaken with Panic Disorder patients. Based on their research, Pauli et al. (1991) and Van der Does et al., (2000) both conclude that the critical factor in Panic Disorder patients' dysfunction is the triggering of negative schemas related to body sensations and the interpretation of heart sensations as threatening rather than an increased ability to detect heart rate per se.

Finally in the current study it was found that variation in the threat level of heart-related information did not affect whether an attentional bias towards threatening heart-related information is displayed in CVD participants who are low in HFA as predicted by the CMV (Mogg et al., 2000b). Rather these results seem to indicate that personally relevant information at either a moderate or high level of threat attracts attention in

CVD participants, regardless of their HFA status, and may be a functional mechanism designed to gather information about the individuals' diagnosed illness. Further testing with CVD participants high or low in HFA and stimulus words with more threat variation is required to clarify this finding. Also, as theorised by the CMV (Mogg et al., 2000b) and the BADA (Williams et al., 1988, 1997) an interaction between state anxiety and HFA was predicted but not found in the current study. These results are probably related to low levels of state anxiety and should not be regarded as conclusive.

Applied Implications, Methodological Limitations and Recommendations

Given the proposed theoretical and clinical importance of attentional biases in the cause and maintenance of anxiety disorders these findings provide evidence-based justification for the refinement of CBT intervention programs in the treatment of HFA, in individuals either with or without organic illness. Specifically, the results suggest that exposure to threatening cardiac-related information, coupled with cognitive techniques to restructure existing unhelpful CVD schemas may mitigate the over-allocation of attentional resources to cardiac-related information and avoid catastrophic interpretation of this information, short-circuiting the negative self-perpetuating cycle characteristic of HFA. Furthermore a recent study by See et al. (2009), provides evidence to suggest that the direct retraining of attention allocation patterns through the use of a dot-probe based training procedure as developed by MacLeod et al. (2002) may reduce both trait and state anxiety scores and may also be useful in interrupting the mechanisms linked to the maintenance of HFA.

Despite careful consideration of the methodology adopted, the present study has limitations that must be acknowledged in interpreting the data. First, while HFA and state and trait anxiety were assessed, depression was not. In retrospect it would have been useful to control for depression because comorbid depression has been shown to alter anxiety-related attentional bias patterns displayed in anxious (Mogg &Bradley, 2005) and physically ill (Livermore et al., 2005) participants. Secondly, prevention of conscious access to information in the subliminal processing trial would have strengthened the project. Backward masking and more rigorous awareness checks, as outlined by Ononaiye et al. (2007) are therefore recommended in future. Thirdly, 15.7% of all participants were excluded from this study due to slow latencies and an error rate of 10% or higher, compared to visual-probe studies with younger participants of whom approximately 5% are excluded (e.g., Lees, Mogg & Bradley, 2005). The participants excluded were also significantly older than those retained, suggesting that exclusion may be related to slowed or compromised motor coordination, unfamiliarity with computer tasks and age-related difficulties in ability to sustain attention over a long period of time as suggested in past research (e.g., Fox & Knight, 2005). Very little has been reported on the appropriateness of the visual-probe task for use with the elderly, but attention to this question is clearly desirable. Fourth, a generalisation of the present study's results may be compromised because we know nothing about the people who did not choose to participate; it is possible that they had higher illness severity and anxiety. A more structured recruitment strategy could shed some light on this issue. Fifth, to avoid excluding any CVD recruits a median split was utilised to establish the HFA group membership, which resulted in a number of participants who fell close to the median being included in the analysis, so there was less clear contrast between the high and low HFA groups than would have been ideal. Future research may benefit from considering HFA as a continuous variable, or basing the groups on a quartile split technique. Sixth, It is also possible that variation in exposure and familiarity with cardiac stimuli led to the differing results between the five experimental groups. Participants in the CVD groups may have encountered more cardiac-related language when compared to some of the non-CVD participants (via attending doctors consultations, rehabilitation programs etc). This is a potentially significant issue because norms regarding word frequency only represent approximate population values; it may well be, than, that CVD and potentially the NoCVD-HighHFA participants had greater familiarity than some of the other non-CVD participants with cardiac-related words and thus there is a potential confound between stimulus threat value and subjective frequency of usage (Eysenck et al., 1987; Mogg et al., 2000b). The use of pictorially based stimuli has been suggested as a means to addressing this issue (Mogg et al., 2000b). Finally, Holmes et al. (2009) have recently used electrophysiological data in conjunction with the dot-probe task to explore attentional allocation to positive and negative material, which allows for more accurate and detailed elucidation of the timing and direction of attentional biases. Further, this type of procedure addresses the criticism that visual-probe methodology only provides a "snap shot view" of attentional bias (Mogg & Bradley, 2005). It is recommended that future research also adopt electrophysiological measures to compliment the visual-probe task data.

Despite the limitations, the results from this study demonstrate that information processing methodologies such as the visual-probe task can be usefully applied to elderly CVD patients, without relying exclusively on self-report measures. The current results indicate that these methodologies provide additional support for the theoretical model of HFA (Eifert, 1992; Eifert et al., 2000b).

Conclusions

This is the first empirical study to date to explore attentional bias in HFA using an objective measure of attentional deployment. The results provide evidence consistent with the current model of HFA (e.g., Eifert et al., 2000b; Zvolensky et al., 2008), Specifically, they suggest that HFA is a discrete anxiety disorder characterised by a content-specific attentional bias towards cardiac-related stimuli at both the subliminal and supraliminal processing levels. Further, the findings support the supposition that the underlying mechanism of biased information processing that contributes in part to the perpetuation of elevated anxiety regarding the heart and the resultant negative health behaviours is common to both groups. The results also reveal that CVD patients without HFA may give preferential attention to cardiac-related information, but this may be a functional behaviour, prompting effective CVD management. Differences in illness representations and consequently the interpretation of the attended cardiac information between groups may possibly account for the differences in biopsychosocial outcomes documented in individuals with high HFA opposed to those with low HFA, but further research is required to verify this. Finally, these findings may be useful in the development of effective CVD prevention, management and rehabilitation programs for individuals both with and without an organic disease, because the results provide evidence-based justification for the application of a Cognitive-Behavioural approach to HFA.

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Appendix A

Questionnaires and Forms

Appendix A1: Participant Information Questionnaire

Appendix A2: Participant Release of Information Form

Appendix A3: Doctors Record on Participant Eligibility to Participant Sheet

Appendix A4: The Cardiac Anxiety Questionnaire

Appendix A5: The State-Trait Anxiety Inventory (State and Trait version)

Appendix A6: Marlowe-Crowne Social Desirability Scale

Appendix A7: In Session Questionnaire

Appendix A8: Visual Analogue Scales for Low and Anxious Mood State

Appendix A1: Participant Information Questionnaire

Participant Information Questionnaire

Please complete this questionnaire as accurately as possible, being careful to answer each question below

Name: Mr/Miss/Ms/Mrs (Please circle)____________________________(Full name)

***Date of Birth*__________________ *Age*__________**

Sex *male/female (Please circle)*

---

1) Is English your first language? *yes/no (Please circle)*

2) To the best of your knowledge do you currently suffer from any form of cardiovascular disease? *yes/no (Please circle)*

***If so what s your medical diagnosis?*____**

Please see the instructions at the end of the questionnaire if you checked yes to having a cardiovascular disease.

To the best of your knowledge do you currently have any other significant health conditions? (Please list)

____

____

____

3) Are you currently taking any medications? *yes/no (Please circle)*

If so please list them

____

____

____

____

____

**If you have ticked yes to having a cardiovascular disease and would like to take part in this research study, it is necessary for us to ask your treating practitioner three questions regarding your condition (diagnosis, duration and severity). To do this, it is important that you provide written permission for the researchers to contact your treating practitioner. We also wish to know that your treating practitioner does not think that participation in this research project would involve undue risk to your health. Please complete the attached permission sheet so we may contact your treating professional. NB: those without CVD do not need to complete this form.*

Appendix A2: Participant Release of Information Form

Cardiovascular Disease and Attention Research Study
Participant Release of information form

I am aware that for me to participate in this study the researchers require that my treating practitioner be contacted and asked three questions about my cardiovascular disease:

a) What is the documented formal diagnostic label for the participants Cardiovascular Disease? (Please provide label)

b) How long has this participant held this diagnosis? (Please indicate in years and months)

c) In your opinion what severity of impact does this condition have on the individuals organic health status? (Please indicate on the scale below)

High Severity____Medium high severity_____Moderate Severity_____Medium low severity____Low Severity

I ____________________________ (name of participant) agree that the researcher of this

project______________________(Kelly Pettit) may contact (Name of treating

Practitioner) ____________________________________ and ask the three listed

questions regarding my cardiovascular disease.

Appendix A2: Participant Release of Information Form cont.

I also give permission for my treating practitioner to provide written conformation that I am fit to participate in the study and understand that my participation in this research is dependent upon this consent being granted.

Signature of Participant____________________

*Date*______________

Treating Practitioner Details (Please complete)

Name: ____________________________________

Name of Clinic or Practice:

____

Address:____

____

Phone Number: ___________________________

Email________________________________

Appendix A3: Doctors Record on Participant Eligibility to Participant Sheet

Doctor's consent Form for patients to participate in the Cardiovascular Disease and Attention Research Study

I__________________________________(Practitioners full name) am aware of and support my patient's

________________________________(Patients full name) intention to participate in the above mentioned research study, which is being run through the University of Tasmania's School of Psychology. I understand that this study will examine the effect of heart-focused anxiety on the cognitive processing of health information in Individuals with and without Cardiovascular Disease and am aware of the methodology, which the researchers will be using. In my opinion this patient is fit to participate in the study and will not be placing him or herself at any undue health risk by doing so.

Signature of Practitioner______________________

Date________________

Appendix A3: Doctors Record on Participant Eligibility to Participant Sheet cont.

Individual Patient Information Regarding their Heart Condition

Your Patient has provided us with written consent for you to provide limited information concerning their heart disease by answering the following questions (Please see attached release of information form). **Please complete all of the three questions as accurately as possible.**

a) What is the Clinical diagnosis for this patient's cardiovascular disease? (Please provide diagnostic label)

____

b) How long has this participant held this diagnosis? (Please indicate in
years and months)

____

c) In your opinion what severity of impact does this condition have on the individuals organic health status? (Please indicate by circling the appropriate label on the scale provided below)

High Severity___Medium high severity_____Moderate Severity_____Medium low severity____Low Severity

Question C may require additional notes, please document in the space provided below.

____
____
____
____
____

Appendix A4: The Cardiac Anxiety Questionnaire (CAQ)

Heart Questionnaire

Please rate each of the items by circling the answer (number) that best applies to you:

		Never	*Rarely*	*Sometimes*	*Often*	*Always*
1.	I pay attention to my heartbeat	0	1	2	3	4
2.	I avoid physical exertion	0	1	2	3	4
3.	My racing heart wakes me up at night	0	1	2	3	4
4.	Chest pain/discomfort wakes me up at night	0	1	2	3	4
5.	I take it easy as much as possible	0	1	2	3	4
6.	I check my pulse	0	1	2	3	4
7.	I avoid exercise or other physical work	0	1	2	3	4
8.	I can feel my heart in my chest	0	1	2	3	4
9.	I avoid activities that make my heart beat faster	0	1	2	3	4
10.	If tests come out normal, I still worry about my heart	0	1	2	3	4
11.	I feel safe being around hospital, Physician or other medical facility	0	1	2	3	4
12.	I avoid activities that make me sweat	0	1	2	3	4
13.	I worry that doctors do not believe my symptoms are real	0	1	2	3	4

When I have chest discomfort or when my heart is beating fast:

14.	I worry that I may have a heart attack	0	1	2	3	4
15.	I have difficulty concentrating on anything else	0	1	2	3	4
16.	I get frightened	0	1	2	3	4
17.	I like to be checked out by a doctor	0	1	2	3	4
18.	I tell friends or family	0	1	2	3	4

Appendix A5: The State-Trait Anxiety Inventory

SELF EVALUATION QUESTIONNAIRE (Trait Form)

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but given the answer, which seems to describe how you generally feel.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
I feel pleasant	1	2	3	4
I feel nervous and restless	1	2	3	4
I feel satisfied with myself	1	2	3	4
I wish I could be as happy as others seem to be	1	2	3	4
I feel like a failure	1	2	3	4
I feel rested	1	2	3	4
I am "calm, cool, and collected"	1	2	3	4
I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
I worry too much over something that really doesn't matter	1	2	3	4
I am happy	1	2	3	4
I have disturbing thoughts	1	2	3	4
I lack self-confidence	1	2	3	4
I feel secure	1	2	3	4
I make decisions easily	1	2	3	4
I feel inadequate	1	2	3	4
I am content	1	2	3	4
Some unimportant thought runs through my mind and bothers me	1	2	3	4
I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
I am a steady person	1	2	3	4
I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Appendix A5: The State-Trait Anxiety Inventory cont.

SELF EVALUATION QUESTIONNAIRE (State Form)

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now, that is at this moment.* There are no right or wrong answers. Do not spend too much time on any one statement but given the answer, which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
I feel calm	1	2	3	4
I feel secure	1	2	3	4
I am tense	1	2	3	4
I feel tense	1	2	3	4
I feel strained	1	2	3	4
I feel at ease	1	2	3	4
I feel upset	1	2	3	4
I am presently worrying over possible misfortunes	1	2	3	4
I feel satisfied	1	2	3	4
I feel frightened	1	2	3	4
I feel comfortable	1	2	3	4
I feel self-confident	1	2	3	4
I feel nervous	1	2	3	4
I am jittery	1	2	3	4
I feel indecisive	1	2	3	4
I feel content	1	2	3	4
I am worried	1	2	3	4
I feel confused	1	2	3	4
I feel steady	1	2	3	4
I feel pleasant	1	2	3	4

Appendix A6: Marlowe-Crowne Social Desirability Scale

PERSONAL CHARACTERISTICS QUESTIONNAIRE

Listed below are a number of statements concerning personal attributes and traits. Please read each item carefully and decide whether the statement is true or false as it applies to you personally. Please circle T or F.

Before I vote, I thoroughly investigate the qualifications of all candidates.	**T**	**F**
I never hesitate to go out of my way to help someone in trouble.	**T**	**F**
It is sometimes hard for me to go on with my work if I am not encouraged.	**T**	**F**
I have never intensely disliked anyone.	**T**	**F**
On occasion, I have had doubts about my ability to succeed in life.	**T**	**F**
I sometimes feel resentful when I don't get my own way.	**T**	**F**
I am always careful about my manner of dress.	**T**	**F**
My table manners at home are as good as when I eat out in a restaurant.	**T**	**F**
If I could get into a movie without paying and be sure I was not seen, I would probably do it.	**T**	**F**
On a few occasions, I have given up doing something because I thought too little of my ability.	**T**	**F**
I like to gossip at times	**T**	**F**
There have been times when I felt like rebelling against people in authority even though I knew they were right.	**T**	**F**
No matter who I'm talking to, I'm always a good listener.	**T**	**F**
I can remember "playing sick" to get out of something.	**T**	**F**
There have been few occasions when I took advantage of someone.	**T**	**F**

I'm always willing to admit it when I make a mistake.	T	F
I always try to practice what I preach.	T	F
I don't find it particularly difficult to get along with loudmouthed, obnoxious people.	T	F
I sometimes try to get even rather than forgive and forget.	T	F
When I don't know something, I don't mind admitting it.	T	F
I am always courteous, even to people who are disagreeable.	T	F
At times I have really insisted on having things done my own way.	T	F
There have been occasions when I felt like smashing things.	T	F
I would never think of letting someone else be punished for my wrongdoings.	T	F
I never resent being asked to return a favour.	T	F
I have never made a long trip without checking the safety of my car.	T	F
There have been times when I was jealous of the good fortune of others.	T	F
I have almost never felt the urge to tell someone off.	T	F
I am sometimes irritated by people who ask favours of me.	T	F
I have never felt that I was punished without cause.	T	F
I sometimes think when people have a misfortune, they only get what they deserved.	T	F
I have never deliberately said something that hurt someone's feelings.	T	F

Appendix A7: The In Session Questionnaire

NAME: ________________________________ CODE__________

Personal Characteristics

1) Are you predominately **LEFT** or **RIGHT** handed *(please circle the appropriate Hand).*

2) Are you married or in a long-term committed relationship? **Yes/no** *(please circle one).*

3) Please indicate in years how long you have been in this relationship____________

Personal and Family Health History

1) Is there a history of heart disease in your family? **Yes/no** *(please circle one)*

If so, please indicate their relationship to you. If there are several please note each family member as they relate to you in the space provided below (i.e., father).

____
____
____
____
____

2) Do you wear visual aids? **Yes/no** *(please circle one.)*

3) Has this corrected your visual problem? **Yes/no** *(please circle one).*

If not, please describe your remaining visual impairment (s) below.

____
____
____

3) Have you ever experienced a stroke or any major damage to your brain (i.e., significant blow to the head, aneurysm etc) **Yes/no** *(please circle one)*

If so please describe briefly the nature of the incident and year that it occurred in the space below

____
____
____

Please also complete

1) **Personal Characteristics questionnaire**

Appendix A8: Visual Analogue Scales for Low and Anxious Mood State

Mood Scale

Please complete the two scales below by circling the number which best describes how you feel at the exact time when you are requested by your examiner to complete the scales.

Not at all anxious				*Neutral*					*Extremely anxious*
1	2	3	4	5	6	7	8	9	10

Not at all unhappy				*Neutral*					*Extremely unhappy*
1	2	3	4	5	6	7	8	9	10

Appendix B

Experimental Word Pairs

Heart-High Threat Words	*Paired Neutral Words*
ANGINA	SPRINKLER
CLOT	PETALS
BLOCKED-ARTERY	LATTICE-FENCE
CARDIAC-ARREST	VEGETABLE-GARDEN
CARDIAC-EMERGENCY	ELECTRIC-MOWER
CHEST-PAIN	BACK-FENCE
CORONARY	APPLETREES
COLLAPSE	POTPLANT
DEFIBRILLATION	HORTICULTURE
CHOLESTEROL	BARBEQUE
HEART-ATTACK	ROSE-BUSHES
POUNDS	GREENHOUSE
HEART-FAILURE	GARDEN-GLOVES
HYPERTENSION	WHEELBARROW
FLATLINE	COMPOST
ARRHYTHMIA	SUNFLOWER
NUMB	RAKE
PALPITATE	DAFFODIL
STROKE	HEDGE
ANEURYSM	FERTILISER

Heart-Moderate Threat Words	*Paired Neutral Words*
HEART	RUGS
BLOOD-VESSELS	LAMP-STAND
HEART-VALVES	LOUNGE-SUITE
HEART-MONITOR	DISPLAY-CABINET
AORTA	FURNITURE
HEART-MUSCLE	DINNING-TABLE
STETHOSCOPE	WATERBED
BEATS	CHAIR
PULMONARY-SYSTEM	BANANA-BED
THUMPS	BEANBAG
PULMONARY	HALLSTAND
PULSATION	ARMCHAIR
CARDIOVASCULAR	HIGHCHAIR
PULSE	CUPBOARD
ARTERY	BUNKBED
BREATHING	FOOTSTOOL
OXYGENATED	WARDROBE
VASCULAR	LAMPSHADE
HEART RATE	COFFEE TABLE
HEARTBEAT	SIDEBOARD

Heart-High Positive Words	*Paired Neutral Words*
CUPID	TANKTOP
HEARTFELT	TROUSERS
GOOD-HEARTED	BUSINESS-SUITS
LOVE-HEART	LONG-JOHNS
HEARTTHROB	TRACKSUIT
HEARTENED	CLOTHING
HEART-WARMING	MINI-SKIRTS
HEARTY	SKIVVY
HEART-MELTING	FORMAL-DRESS
LIGHTHEARTED	SPORTSJACKET
OPENHEARTED	PYJAMAS
PASSION	BLAZER
LIONHEARTED	BALACLAVA
HEARTLAND	LEGGINGS
VALENTINE	CARDIGAN
SWEETHEART	PULLOVER
WARMHEART	TURTLENECKS
HEARTS-DESIRE	COWBOY-HAT
WHOLEHEARTED	OVERCOAT
SOFT-HEARTED	WESTERN-SHIRTS

Social-High Positive Words	*Paired Neutral Words*
ACCEPTED	CALENDER
HIGH-ACHIEVER	PENCIL-SHARPENERS
ADMIRED	SHEDDER
CHAMPION	ENVELOPE
COMPETENT	PHOTOCOPIER
WELL-INFORMED	COMPUTER-DESK
GIFTED	RUBBER
ESTEEMED	CLIPBOARD
ADORABLE	WATERCOOLER
KNOWLEDGEABLE	STATIONARY
FIRST-PLACE	BOOK-SHELF
PROFICIENT	STAPLER
HIGHLY-SKILLED	PAPER-CLIPS
SOCIALLY-SKILLED	DOCUMENT-FOLDERS
SKILLED	PENCIL
SUCCESSFUL	THUMBTACK
INGENIOUS	BINDER
WELL-LIKED	WHITE-OUT
CHERISHED	BRIEFCASE
DESERVING	NOTEPAD

Social-High Threat Words	*Paired Neutral Words*
ASHAMED	WEATHER
CRITICISED	EQUATOR
LOSER	COUNTRY
DESPISED	MOUNTAINS
BLACK-SHEEP	LAND-MASS
HOPELESS-CASE	OCEAN-BED
HATED	VALLEY
HUMILIATE	GEOGRAPHY
PUT-DOWNS	COAST-LINES
INADEQUATE	ENVIRONMENT
BORN-LOSER	TIME-ZONE
MOCKED	ROCKS
SOCIALLY-FLAWED	CONTINENTAL-DRIFT
OSTRACISED	CONTINENT
FEEBLE-MINDED	WEATHER-PATTERN
TEASED	MAPS
PATHETIC	HEMISPHERE
UNPOPULAR	HABITAT
USELESS	DESERT
UNSUCCESSFUL	GLACIER

Disaster-High Threat Words	*Paired Neutral Words*
AVALANCHE	WEATHERBOARD
AIR-STRIKE	WORK-BENCH
BOMBING	DECKING
CYCLONE	SANDER
CAR-ACCIDENT	TAPE-MEASURE
DROWNING	TRACTOR
EARTHQUAKE	WINDOW
ELECTROCUTION	SCAFFOLDING
FAMINE	ROOFING
FIREARMS	EXCAVATOR
INFERNO	OVERALLS
HURRICANE	CONCRETING
MASS-MURDER	BLUE-PRINTS
MINEFIELD	METAL
NUCLEAR-ACCIDENT	SAFET-GLASSES
MURDERER	RENDERING
HAZARD	PAVING
VOLCANIC-ERUPTION	SAND-BLASTER
STRANGLED	DOORWAY
NUCLEAR-WEAPONS	CATHEDRAL-CEILING

Neutral Words	*Paired Neutral Words*
CRICKET	GIRAFFE
SKATE	WHALES
NETBALL	DOLPHIN
LAWN-BOWLS	ATLANTIC-SALMON
LACROSSE	ANTELOPE
CHESS	TURTLE
KAYAKING	KANGAROO
FIN-SWIMMING	WEDEGTAIL-EAGLES
SPRINTING	POSSUM
SQUASH	DUCK
WATERPOLO	ORANGUTAN
GYMNASTICS	CHIMPANZEE
VOLLEYBALL	KOALA
TRIATHLONS	BANDICOOTS
CROQUET	MONGOOSE
TOUCH-FOOTBALL	HUMPBACK-WHALE
WEIGHT-LIFTING	SHETLAND-PONIES
BADMINTON	ECHIDNA
HOCKEY	WALLABY
TABLE-TENNIS	PIGMY-POSSUMS

Appendix C

The Selection and Development of the Heart-High Positive Stimuli

Appendix C: The Selection and Development of the Heart-High Positive Stimuli

The Heart as a component of Physical and Emotional Health

Through cultural conditioning the heart's functioning is central to western society's concept of emotional and physical well-being and has become a core symbol of heath (Eifert, 1992; Zvolensky et al., 2008). The concept of the heart is one, which has at least two major components, first, that which describes the biological organ as documented in current medical sources. Secondly, the concept involves that, which describes the spirit and/or the emotionality of an individual/individuals and/or situation. Godwin (2001) documents that throughout history the development of the semantics and linguistics of the physical heart has been intimately linked with the human life force and various other spiritual/emotional concepts (please see Godwin, 2001 for a discussion of this topic). Numerous metaphors and expressions link the heart symbolically and intrinsically to fundamental emotional experiences. For example "heartfelt" thanks, "broken heart" to describe feeling of loss.

Thus it is argued that the development of the English vocabulary's description of the physical heart, and particularly positive aspects of the heart are intricately intertwined in meaning with spiritual/emotional concepts. It is therefore argued that to devise a list of purely positive heart-focused words that only pertain to the physical organ is not possible when doing so in the English Language.

As a result the experimenters have developed three lists of heart-focused words

1) High Threat - physical heart
2) Moderate Threat - physical heart

3) High Positive – spiritual/emotional

This was done in an attempt to test the Emotionality hypothesis. More specifically it was introduced to test for the existence of the underlying construct in heart-focused anxiety –a *negative* attentional bias towards cardio-related introspective symptoms and external information regarding the heart (Eifert et al., 2000b).

Appendix D

Experimental Words Pilot Study Data

Appendix D1: Mean Valence Rating for Experimental Words

Appendix D2: CVD and NCVD Group Mean Valence Ratings for Word Categories and Statistical Analysis on Group Valence Ratings

Appendix D1: Mean Valence Rating for Experimental Words

WORD	*WORD TYPE*	*MEAN and STANDARD DEVIATION VALENCE RATING*
ANGINA	Heart-High Threat	1.813
CLOT	Heart-High Threat	1.825
BLOCKED-ARTERY	Heart-High Threat	1.625
CARDIAC-ARREST	Heart-High Threat	1.500
CARDIAC-EMERGENCY	Heart-High Threat	1.465
CHEST-PAIN	Heart-High Threat	1.538
CORONARY	Heart-High Threat	1.863
COLLAPSE	Heart-High Threat	1.613
DEFIBRILLATION	Heart-High Threat	2.475
CHOLESTEROL	Heart-High Threat	1.888
HEART-ATTACK	Heart-High Threat	2.013
POUNDS	Heart-High Threat	1.987
HEART-FAILURE	Heart-High Threat	1.438
HYPERTENSION	Heart-High Threat	1.713
FLATLINE	Heart-High Threat	1.560
ARRHYTHMIA	Heart-High Threat	1.788
NUMB	Heart-High Threat	1.750
PALPITATE	Heart-High Threat	1.575
STROKE	Heart-High Threat	1.600
ANEURYSM	Heart-High Threat	1.575
HEART	Heart-Moderate Threat	4.900
BLOOD-VESSELS	Heart-Moderate Threat	4.392
HEART-VALVES	Heart-Moderate Threat	4.363
HEART-MONITOR	Heart-Moderate Threat	4.363
AORTA	Heart-Moderate Threat	4.400
HEART-MUSCLE	Heart-Moderate Threat	4.438
STETHOSCOPE	Heart-Moderate Threat	4.525
BEATS	Heart-Moderate Threat	4.338
PULMONARY-SYSTEM	Heart-Moderate Threat	4.550
THUMPS	Heart-Moderate Threat	4.325
PULMONARY	Heart-Moderate Threat	4.508
PULSATION	Heart-Moderate Threat	4.447
CARDIOVASCULAR	Heart-Moderate Threat	4.688
PULSE	Heart-Moderate Threat	4.845
ARTERY	Heart-Moderate Threat	4.263
BREATHING	Heart-Moderate Threat	4.813
OXYGENATED	Heart-Moderate Threat	4.600
VASCULAR	Heart-Moderate Threat	4.695
HEART RATE	Heart-Moderate Threat	4.266
HEARTBEAT	Heart-Moderate Threat	4.725
CUPID	Heart- High Positive	8.163
HEARTFELT	Heart- High Positive	8.475
GOOD-HEARTED	Heart- High Positive	8.613

LOVE-HEART	Heart- High Positive	8.450
HEARTTHROB	Heart- High Positive	8.413
HEARTENED	Heart- High Positive	8.500
HEART-WARMING	Heart- High Positive	8.513
HEARTY	Heart- High Positive	8.863
HEART-MELTING	Heart- High Positive	8.625
LIGHTHEARTED	Heart- High Positive	8.975
OPENHEARTED	Heart- High Positive	8.741
PASSION	Heart- High Positive	8.725
LIONHEART	Heart- High Positive	8.863
HEARTLAND	Heart- High Positive	8.550
VALENTINE	Heart- High Positive	8.801
SWEETHEART	Heart- High Positive	8.638
WARMHEART	Heart- High Positive	8.850
HEARTS-DESIRE	Heart- High Positive	8.850
WHOLEHEARTED	Heart- High Positive	8.825
SOFT-HEARTED	Heart- High Positive	8.575
ACCEPTED	Social-High Positive	8.500
HIGH-ACHIEVER	Social-High Positive	8.700
ADMIRED	Social-High Positive	8.900
CHAMPION	Social-High Positive	8.975
COMPETENT	Social-High Positive	8.883
WELL-INFORMED	Social-High Positive	8.980
GIFTED	Social-High Positive	8.700
ESTEEMED	Social-High Positive	8.706
ADORABLE	Social-High Positive	8.926
KNOWLEDGEABLE	Social-High Positive	8.830
FIRST-PLACE	Social-High Positive	8.913
PROFICIENT	Social-High Positive	8.500
HIGHLY-SKILLED	Social-High Positive	8.788
SOCIALLY-SKILLED	Social-High Positive	9.125
SKILLED	Social-High Positive	8.763
SUCCESSFUL	Social-High Positive	8.878
INGENIOUS	Social-High Positive	8.938
WELL-LIKED	Social-High Positive	8.725
CHERISHED	Social-High Positive	8.713
DESERVING	Social-High Positive	8.863
ASHAMED	Social-High Negative	1.588
CRITICISED	Social-High Negative	1.559
LOSER	Social-High Negative	1.775
DESPISED	Social-High Negative	1.471
BLACK-SHEEP	Social-High Negative	1.825
HOPELESS-CASE	Social-High Negative	1.488
HATED	Social-High Negative	1.613
HUMILIATE	Social-High Negative	1.528
PUT-DOWNS	Social-High Negative	1.838
INADEQUATE	Social-High Negative	1.638
BORN-LOSER	Social-High Negative	1.650

MOCKED	Social-High Negative	2.463
SOCIALLY-FLAWED	Social-High Negative	1.800
OSTRACISED	Social-High Negative	1.676
FEEBLE-MINDED	Social-High Negative	1.663
TEASED	Social-High Negative	1.913
PATHETIC	Social-High Negative	1.613
UNPOPULAR	Social-High Negative	1.633
USELESS	Social-High Negative	1.600
UNSUCCESSFUL	Social-High Negative	1.838
AVALANCHE	Disaster-High Negative	1.763
AIR-STRIKE	Disaster-High Negative	1.550
BOMBING	Disaster-High Negative	1.925
CYCLONE	Disaster-High Negative	1.675
CAR-ACCIDENT	Disaster-High Negative	1.700
DROWNING	Disaster-High Negative	1.700
EARTHQUAKE	Disaster-High Negative	1.975
ELECTROCUTION	Disaster-High Negative	1.579
FAMINE	Disaster-High Negative	1.697
FIREARMS	Disaster-High Negative	1.563
INFERNO	Disaster-High Negative	1.709
HURRICANE	Disaster-High Negative	1.850
MASS-MURDER	Disaster-High Negative	1.675
MINEFIELD	Disaster-High Negative	1.625
NUCLEAR-ACCIDENT	Disaster-High Negative	1.775
MURDERER	Disaster-High Negative	1.513
HAZARD	Disaster-High Negative	1.713
VOLCANIC-ERUPTION	Disaster-High Negative	1.680
STRANGLED	Disaster-High Negative	1.825
NUCLEAR-WEAPONS	Disaster-High Negative	1.725

Appendix D2: CVD and NCVD group Mean Valence Ratings for Word Categories and Statistical Analysis on Group Valence Ratings

Table 1 shows the valence ratings for each of six word types for CVD and non-CVD participants. Compared with non-CVD participants, CVD participants gave significantly lower Valence ratings to Heart-Moderate Threat and Heart-High Positive words, and significantly higher Valence ratings to Social-High Negative words.

Table 1: Valence Ratings for CVD and non-CVD subjects

	CVD		Non-CVD		
Word Type	Mean	SD	Mean	SD	t
Heart- High Threat	1.65	.17	1.81	.42	-1.663
Heart- Moderate Threat	4.39	.17	4.65	.21	-4.473***
Heart -High Positive	8.55	.25	8.75	.28	-2.412***
Social -High Positive	8.82	.20	8.81	.16	0.019
Social -High Threat	1.83	.36	1.58	.15	2.959**
Disaster -High Threat	1.72	.15	1.70	.15	0.324

A further question of interest is whether valence ratings differ significantly between different Negative word types. Table 2 presents valence ratings from the Pilot Study for the three Negative word types (Heart-High Threat, Social-High Threat, and Disaster-High Threat). In order to examine potential differences in valence between these word types, a repeated measures ANOVA was conducted with one between-subject factor (CVD versus no-CVD) and one within subject factor (Word Type). No significant differences were found between the word types ($F(1.69, 67.41) = .071$; $p > .05$). However, a significant two-way interaction between word type and CVD was found ($F(1.685, 67.410) = 6.158$; $p < .01$). As shown in Table 2, the Heart –High Threat words had more positive valence for the non-CVD participants, while the Social-High Threat words had more positive valence for CVD participants.

Table 2: Valence Ratings for Negative Words

Word Type	CVD Mean	SD	Non-CVD Mean	SD
Heart-High Threat	1.65	.17	1.81	.42
Social-High Threat	1.83	.36	1.58	.15
Disaster-High Threat	1.72	.15	1.70	.15

A final set of pilot study analyses examine the question of whether valence ratings differ significantly between Positive word types. Table 3 presents valence ratings from the Pilot Study for the two Positive word types (Heart-High Positive and Social-High Positive). In order to examine potential differences in valence between these word types, a repeated measures ANOVA was conducted with one between-subject factor (CVD versus no-CVD) and one within subject factor (Word Type). Significant differences were found between the word types ($F(1, 40) = .17.32; p < .001$). In addition, a significant two-way interaction between word type and CVD was found ($F(1, 40) = 6.30; p < .05$). Heart-High Positive words had higher valence overall, and more so for non-CVD subjects.

Table 3: Valence Ratings for Positive Words

Word Type	CVD Mean	SD	Non-CVD Mean	SD
Word Type	Mean	SD	Mean	SD
Heart-High Positive	8.55	.25	8.75	.28
Social-High Positive	8.82	.20	8.81	.16

Appendix E

Practice and Awareness Check Word Pairs

E1: Practice Word Pairs

E2: Awareness Check Word Pairs

E1: Practice Word Pairs

RESORT	CLARET
FLOUR	SHEET
ENGINEER	NORTHERN
WORDS	UNTIL
TICKET	DONKEY
PRODUCE	OPINION
TOUR	SAIL
ACADEMY	STAINED
NUMERAL	ORGANIC
PROFIT	RETURN
FIELD	WEDGE
RECREATION	PERMISSION

E2: Awareness Check Word Pairs

CARPET	STONES
CHAIR	FOREST
TABLE	NATURE
WINDOW	SEASON
DOOR	FIELD
STAIR	HEDGE
BENCH	FRUIT
CUPBOARD	MUSHROOM
SINK	HERD
CEILING	BRANCHES
CELERY	TABLES
CARROT	LAMPS
LETTUCE	ORNAMENT
BEANS	DESKS
APPLE	SHELF
SPINACH	LOUNGE
ORANGE	CLOSET
BANANA	MIRROR
TOMATOE	OTOMAN
GRAPE	STOOL
SCRAP	PINNED
LISTED	ARRANGED
ANSWERED	DRAFTING
RECORDED	SCHEDUALED
CITED	POSTED
COMPUTED	ORGANISED
OUTLINED	NEGOTIABLE
ACOUNTED	CALCULATED
CATELOGUED	PERFORATED
SUMMARISED	MANUALISED

Appendix F

Participant Information Form and Consent Form

Appendix F1: Participant Information Sheet

Appendix F2: Participant Consent Form

Appendix F1: Participant Information Sheet

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Participant Information Sheet
Cardiovascular Disease, Personality and Attention

Chief Investigators: Dr Elaine Hart and Mr Peter Ball **Investigator:** Kelly Pettit

Purpose of the study: This study is being completed as a partial fulfilment of the requirements for a postgraduate degree in Clinical Psychology. The experiment aims to investigate how participants direct their attention towards information, which may have particular meaning for them.

This project will be open to participants of all ages and both sexes with and without existing cardiovascular disease.

To be involved in this study, you need to be able to use a standard computer. If you decide to participate, you will be presented with pencil and paper questionnaires that look at common personality characteristics. You will then complete a short reading task and a reaction time computer task in which you will be asked to attend to words on a computer screen and then respond to the appearance of an arrow that will replace the words by using the left and right arrow keys to identify which direction the arrow is pointing on the screen. The time commitment for your involvement will be approximately 1.5 hours.

The information that we collect will be kept strictly confidential. Only the researchers conducting the investigation will have access to the identifying data, which will be kept in a locked filing cabinet at the University of Tasmania. Following your experimental session, all identifying information will be removed from your data and replaced with a code. This code will be provided to you, should you wish to obtain information from the researcher regarding your results. The results of the study may be published in journal articles but there will be no identifying information on these documents. You may have access to your personal data or group data on request.

There is no payment for volunteering to participate in this study and participation is completely voluntary. You are free with draw from this study at any time without prejudice.

This project has been approved by the University of Tasmania Ethics Committee. If you have any ethical concerns or complaints about the manner in which this project is being conducted, you may contact members of the University Human Research Ethics Committee on (03) 62262763.
If participants have any ethical or personal concerns about the experiment, they may also discuss those concerns confidentially with a University Student Counsellor.

If you require further information at any stage please do not to hesitate to contact Ms Kelly Pettit on 0408 058 528, email: k_pettit@utas.edu.au. You may also contact Dr. Elaine Hart on (03) 62262936, email: Elaine.Hart@utas.edu.au.

Participants will be provided with copies of this information sheet and the statement of informed consent to keep.

Appendix F2: Participant Consent Form

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Cardiovascular Disease, Personality and Attention

Research Study
Participant Consent Form.

Statement by the participant

1. I have read and understood the **information sheet** regarding this study detailing the nature of this study and any questions I have asked have been answered to my satisfaction.

2. I understand that the study involves the following procedures

a) Completing several questionnaires
b) One oral reading task
c) Completing a computer task in which I will be required to respond to screen stimuli by pressing the left or right arrow key.

3. I understand that all research data will be treated as confidential and my data and questionnaires will not be identifiable by name and all recordings will be erased at the end of the experimental session.

4. I agree that research data gathered for the study may be published provided that I cannot be identified as a subject.

5. I agree to participate in this investigation and understand that I may withdraw at any time without prejudice.

Signature of the participant............................ Date....................

Statement by investigator

I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of Investigator: **Ms Kelly Pettit**

Signature of investigator.......................... Date..................

Appendix G

Statistical Output

G1: Subliminal Post Hoc Pairwise Comparisons

G2: Supraliminal Post Hoc Pairwise Comparisons

G1: Subliminal Post Hoc Pairwise Comparisons

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
1.00 no cvd, low HFA	1	2	-8.461(*)	2.485	.001	-13.373	-3.549
		3	-27.780(*)	3.095	.000	-33.897	-21.664
		4	1.927	3.812	.614	-5.608	9.462
		5	-34.197(*)	4.484	.000	-43.060	-25.335
		6	3.392	5.932	.568	-8.333	15.117
		7	-20.462(*)	2.695	.000	-25.790	-15.135
	2	1	8.461(*)	2.485	.001	3.549	13.373
		3	-19.319(*)	3.343	.000	-25.928	-12.711
		4	10.388(*)	3.774	.007	2.928	17.848
		5	-25.736(*)	4.215	.000	-34.068	-17.404
		6	11.853	6.053	.052	-.110	23.817
		7	-12.001(*)	2.354	.000	-16.654	-7.348
	3	1	27.780(*)	3.095	.000	21.664	33.897
		2	19.319(*)	3.343	.000	12.711	25.928
		4	29.707(*)	4.211	.000	21.384	38.031
		5	-6.417	4.033	.114	-14.388	1.554
		6	31.172(*)	5.823	.000	19.662	42.682
		7	7.318(*)	2.805	.010	1.773	12.863
	4	1	-1.927	3.812	.614	-9.462	5.608
		2	-10.388(*)	3.774	.007	-17.848	-2.928
		3	-29.707(*)	4.211	.000	-38.031	-21.384
		5	-36.124(*)	4.611	.000	-45.237	-27.011
		6	1.465	5.534	.792	-9.472	12.403
		7	-22.389(*)	3.158	.000	-28.631	-16.147
	5	1	34.197(*)	4.484	.000	25.335	43.060
		2	25.736(*)	4.215	.000	17.404	34.068
		3	6.417	4.033	.114	-1.554	14.388
		4	36.124(*)	4.611	.000	27.011	45.237
		6	37.590(*)	5.907	.000	25.914	49.265
		7	13.735(*)	3.129	.000	7.550	19.921

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	**(I) word**	**(J) word**	**Mean Difference (I-J)**	**Std. Error**	**Sig.(a)**	**95% Confidence Interval for Difference(a)**	
			Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**
	6	1	-3.392	5.932	.568	-15.117	8.333
		2	-11.853	6.053	.052	-23.817	.110
		3	-31.172(*)	5.823	.000	-42.682	-19.662
		4	-1.465	5.534	.792	-12.403	9.472
		5	-37.590(*)	5.907	.000	-49.265	-25.914
		7	-23.854(*)	5.413	.000	-34.553	-13.156
	7	1	20.462(*)	2.695	.000	15.135	25.790
		2	12.001(*)	2.354	.000	7.348	16.654
		3	-7.318(*)	2.805	.010	-12.863	-1.773
		4	22.389(*)	3.158	.000	16.147	28.631
		5	-13.735(*)	3.129	.000	-19.921	-7.550
		6	23.854(*)	5.413	.000	13.156	34.553
2.00 no cvd, low HFA, High T	1	2	6.215	3.514	.079	-.732	13.161
		3	4.005	4.376	.362	-4.645	12.655
		4	-6.330	5.391	.242	-16.986	4.326
		5	6.750	6.341	.289	-5.784	19.284
		6	16.523	8.389	.051	-.059	33.104
		7	13.684(*)	3.812	.000	6.150	21.218
	2	1	-6.215	3.514	.079	-13.161	.732
		3	-2.209	4.728	.641	-11.555	7.137
		4	-12.545(*)	5.338	.020	-23.095	-1.994
		5	.535	5.961	.929	-11.248	12.319
		6	10.308	8.560	.230	-6.611	27.227
		7	7.470(*)	3.329	.026	.889	14.051
	3	1	-4.005	4.376	.362	-12.655	4.645
		2	2.209	4.728	.641	-7.137	11.555
		4	-10.335	5.955	.085	-22.107	1.436
		5	2.745	5.703	.631	-8.527	14.017
		6	12.517	8.235	.131	-3.760	28.795
		7	9.679(*)	3.967	.016	1.837	17.521
	4	1	6.330	5.391	.242	-4.326	16.986
		2	12.545(*)	5.338	.020	1.994	23.095
		3	10.335	5.955	.085	-1.436	22.107
		5	13.080(*)	6.520	.047	.192	25.968
		6	22.853(*)	7.826	.004	7.384	38.321

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
		7	20.014(*)	4.466	.000	11.187	28.842
	5	1	-6.750	6.341	.289	-19.284	5.784
		2	-.535	5.961	.929	-12.319	11.248
		3	-2.745	5.703	.631	-14.017	8.527
		4	-13.080(*)	6.520	.047	-25.968	-.192
		6	9.773	8.354	.244	-6.739	26.285
		7	6.934	4.426	.119	-1.813	15.682
	6	1	-16.523	8.389	.051	-33.104	.059
		2	-10.308	8.560	.230	-27.227	6.611
		3	-12.517	8.235	.131	-28.795	3.760
		4	-22.853(*)	7.826	.004	-38.321	-7.384
		5	-9.773	8.354	.244	-26.285	6.739
		7	-2.838	7.654	.711	-17.968	12.291
	7	1	-13.684(*)	3.812	.000	-21.218	-6.150
		2	-7.470(*)	3.329	.026	-14.051	-.889
		3	-9.679(*)	3.967	.016	-17.521	-1.837
		4	-20.014(*)	4.466	.000	-28.842	-11.187
		5	-6.934	4.426	.119	-15.682	1.813
		6	2.838	7.654	.711	-12.291	17.968
3.00 CVD, low HFA	1	2	9.443(*)	2.895	.001	3.721	15.165
		3	5.284	3.605	.145	-1.841	12.410
		4	26.905(*)	4.441	.000	18.127	35.683
		5	4.857	5.224	.354	-5.468	15.182
		6	34.912(*)	6.911	.000	21.252	48.571
		7	18.528(*)	3.140	.000	12.322	24.734
	2	1	-9.443(*)	2.895	.001	-15.165	-3.721
		3	-4.158	3.895	.287	-11.857	3.540
		4	17.462(*)	4.397	.000	8.772	26.153
		5	-4.586	4.911	.352	-14.292	5.121
		6	25.469(*)	7.051	.000	11.532	39.406
		7	9.085(*)	2.743	.001	3.664	14.507
	3	1	-5.284	3.605	.145	-12.410	1.841
		2	4.158	3.895	.287	-3.540	11.857
		4	21.621(*)	4.906	.000	11.924	31.318
		5	-.427	4.698	.928	-9.713	8.858

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
		6	29.627(*)	6.784	.000	16.219	43.036
		7	13.244(*)	3.268	.000	6.784	19.704
	4	1	-26.905(*)	4.441	.000	-35.683	-18.127
		2	-17.462(*)	4.397	.000	-26.153	-8.772
		3	-21.621(*)	4.906	.000	-31.318	-11.924
		5	-22.048(*)	5.371	.000	-32.664	-11.431
		6	8.007	6.447	.216	-4.735	20.749
		7	-8.377(*)	3.679	.024	-15.649	-1.105
	5	1	-4.857	5.224	.354	-15.182	5.468
		2	4.586	4.911	.352	-5.121	14.292
		3	.427	4.698	.928	-8.858	9.713
		4	22.048(*)	5.371	.000	11.431	32.664
		6	30.054(*)	6.881	.000	16.453	43.656
		7	13.671(*)	3.646	.000	6.465	20.877
	6	1	-34.912(*)	6.911	.000	-48.571	-21.252
		2	-25.469(*)	7.051	.000	-39.406	-11.532
		3	-29.627(*)	6.784	.000	-43.036	-16.219
		4	-8.007	6.447	.216	-20.749	4.735
		5	-30.054(*)	6.881	.000	-43.656	-16.453
		7	-16.383(*)	6.305	.010	-28.846	-3.920
	7	1	-18.528(*)	3.140	.000	-24.734	-12.322
		2	-9.085(*)	2.743	.001	-14.507	-3.664
		3	-13.244(*)	3.268	.000	-19.704	-6.784
		4	8.377(*)	3.679	.024	1.105	15.649
		5	-13.671(*)	3.646	.000	-20.877	-6.465
		6	16.383(*)	6.305	.010	3.920	28.846
4.00 no cvd, high HFA	1	2	15.460(*)	2.845	.000	9.838	21.083
		3	9.909(*)	3.542	.006	2.907	16.910
		4	31.912(*)	4.364	.000	23.287	40.538
		5	20.196(*)	5.133	.000	10.050	30.341
		6	32.376(*)	6.790	.000	18.955	45.798
		7	26.227(*)	3.085	.000	20.129	32.326
	2	1	-15.460(*)	2.845	.000	-21.083	-9.838
		3	-5.552	3.827	.149	-13.117	2.013
		4	16.452(*)	4.320	.000	7.912	24.991

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
		5	4.735	4.825	.328	-4.802	14.273
		6	16.916(*)	6.929	.016	3.221	30.611
		7	10.767(*)	2.695	.000	5.440	16.094
	3	1	-9.909(*)	3.542	.006	-16.910	-2.907
		2	5.552	3.827	.149	-2.013	13.117
		4	22.004(*)	4.821	.000	12.476	31.532
		5	10.287(*)	4.616	.027	1.163	19.411
		6	22.468(*)	6.666	.001	9.292	35.643
		7	16.319(*)	3.211	.000	9.971	22.666
	4	1	-31.912(*)	4.364	.000	-40.538	-23.287
		2	-16.452(*)	4.320	.000	-24.991	-7.912
		3	-22.004(*)	4.821	.000	-31.532	-12.476
		5	-11.717(*)	5.278	.028	-22.148	-1.285
		6	.464	6.334	.942	-12.056	12.984
		7	-5.685	3.615	.118	-12.830	1.460
	5	1	-20.196(*)	5.133	.000	-30.341	-10.050
		2	-4.735	4.825	.328	-14.273	4.802
		3	-10.287(*)	4.616	.027	-19.411	-1.163
		4	11.717(*)	5.278	.028	1.285	22.148
		6	12.181	6.762	.074	-1.184	25.546
		7	6.032	3.582	.094	-1.049	13.112
	6	1	-32.376(*)	6.790	.000	-45.798	-18.955
		2	-16.916(*)	6.929	.016	-30.611	-3.221
		3	-22.468(*)	6.666	.001	-35.643	-9.292
		4	-.464	6.334	.942	-12.984	12.056
		5	-12.181	6.762	.074	-25.546	1.184
		7	-6.149	6.196	.323	-18.395	6.097
	7	1	-26.227(*)	3.085	.000	-32.326	-20.129
		2	-10.767(*)	2.695	.000	-16.094	-5.440
		3	-16.319(*)	3.211	.000	-22.666	-9.971
		4	5.685	3.615	.118	-1.460	12.830
		5	-6.032	3.582	.094	-13.112	1.049
		6	6.149	6.196	.323	-6.097	18.395
5.00 CVD, High HFA	1	2	13.815(*)	2.589	.000	8.697	18.933
		3	28.681(*)	3.224	.000	22.307	35.054

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
		4	37.738(*)	3.972	.000	29.887	45.589
		5	36.326(*)	4.672	.000	27.091	45.561
		6	45.945(*)	6.181	.000	33.728	58.162
		7	42.633(*)	2.808	.000	37.082	48.184
	2	1	-13.815(*)	2.589	.000	-18.933	-8.697
		3	14.866(*)	3.484	.000	7.980	21.752
		4	23.923(*)	3.933	.000	16.150	31.696
		5	22.511(*)	4.392	.000	13.830	31.193
		6	32.130(*)	6.307	.000	19.664	44.596
		7	28.818(*)	2.453	.000	23.969	33.666
	3	1	-28.681(*)	3.224	.000	-35.054	-22.307
		2	-14.866(*)	3.484	.000	-21.752	-7.980
		4	9.057(*)	4.388	.041	.384	17.730
		5	7.646	4.202	.071	-.660	15.951
		6	17.264(*)	6.068	.005	5.271	29.257
		7	13.952(*)	2.923	.000	8.174	19.730
	4	1	-37.738(*)	3.972	.000	-45.589	-29.887
		2	-23.923(*)	3.933	.000	-31.696	-16.150
		3	-9.057(*)	4.388	.041	-17.730	-.384
		5	-1.411	4.804	.769	-10.907	8.084
		6	8.207	5.766	.157	-3.190	19.604
		7	4.895	3.291	.139	-1.609	11.399
	5	1	-36.326(*)	4.672	.000	-45.561	-27.091
		2	-22.511(*)	4.392	.000	-31.193	-13.830
		3	-7.646	4.202	.071	-15.951	.660
		4	1.411	4.804	.769	-8.084	10.907
		6	9.619	6.155	.120	-2.547	21.784
		7	6.306	3.261	.055	-.139	12.752
	6	1	-45.945(*)	6.181	.000	-58.162	-33.728
		2	-32.130(*)	6.307	.000	-44.596	-19.664
		3	-17.264(*)	6.068	.005	-29.257	-5.271
		4	-8.207	5.766	.157	-19.604	3.190
		5	-9.619	6.155	.120	-21.784	2.547
		7	-3.312	5.640	.558	-14.460	7.835
	7	1	-42.633(*)	2.808	.000	-48.184	-37.082

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	**(I) word**	**(J) word**	**Mean Difference (I-J)**	**Std. Error**	**Sig.(a)**	**95% Confidence Interval for Difference(a)**	
			Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**
		2	-28.818(*)	2.453	.000	-33.666	-23.969
		3	-13.952(*)	2.923	.000	-19.730	-8.174
		4	-4.895	3.291	.139	-11.399	1.609
		5	-6.306	3.261	.055	-12.752	.139
		6	3.312	5.640	.558	-7.835	14.460
Based on estimated marginal means							
* The mean difference is significant at the .050 level.							
a Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).							

Note: Word Categories: 1 = Heart-High Threat; 2 = Heart-Moderate Threat; 3 = Heart-High Positive; 4 = Social-High Threat; 5 = Social-High Positive; 6 = Disaster-High Threat; 7 = Neutral

G2: Supraliminal Post Hoc Pairwise Comparisons

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
1.00 no cvd, low HFA	1	2	-10.682(*)	3.186	.001	-16.978	-4.385
		3	-22.080(*)	4.131	.000	-30.245	-13.915
		4	1.422	4.454	.750	-7.381	10.225
		5	-29.905(*)	4.575	.000	-38.947	-20.862
		6	3.568	5.619	.526	-7.539	14.675
		7	-17.788(*)	3.322	.000	-24.354	-11.222
	2	1	10.682(*)	3.186	.001	4.385	16.978
		3	-11.398(*)	3.840	.004	-18.989	-3.808
		4	12.104(*)	3.922	.002	4.352	19.856
		5	-19.223(*)	4.067	.000	-27.262	-11.184
		6	14.250(*)	5.261	.008	3.852	24.648
		7	-7.106(*)	2.802	.012	-12.645	-1.567
	3	1	22.080(*)	4.131	.000	13.915	30.245
		2	11.398(*)	3.840	.004	3.808	18.989
		4	23.502(*)	4.146	.000	15.308	31.696
		5	-7.825	4.008	.053	-15.747	.097
		6	25.648(*)	5.610	.000	14.559	36.737
		7	4.292	3.090	.167	-1.816	10.400
	4	1	-1.422	4.454	.750	-10.225	7.381
		2	-12.104(*)	3.922	.002	-19.856	-4.352
		3	-23.502(*)	4.146	.000	-31.696	-15.308
		5	-31.327(*)	4.086	.000	-39.403	-23.251
		6	2.146	5.176	.679	-8.084	12.376
		7	-19.210(*)	3.697	.000	-26.518	-11.902
	5	1	29.905(*)	4.575	.000	20.862	38.947
		2	19.223(*)	4.067	.000	11.184	27.262
		3	7.825	4.008	.053	-.097	15.747
		4	31.327(*)	4.086	.000	23.251	39.403
		6	33.473(*)	5.037	.000	23.516	43.430
		7	12.117(*)	3.435	.001	5.327	18.907
	6	1	-3.568	5.619	.526	-14.675	7.539
		2	-14.250(*)	5.261	.008	-24.648	-3.852
		3	-25.648(*)	5.610	.000	-36.737	-14.559

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
		4	-2.146	5.176	.679	-12.376	8.084
		5	-33.473(*)	5.037	.000	-43.430	-23.516
		7	-21.356(*)	4.959	.000	-31.157	-11.554
	7	1	17.788(*)	3.322	.000	11.222	24.354
		2	7.106(*)	2.802	.012	1.567	12.645
		3	-4.292	3.090	.167	-10.400	1.816
		4	19.210(*)	3.697	.000	11.902	26.518
		5	-12.117(*)	3.435	.001	-18.907	-5.327
		6	21.356(*)	4.959	.000	11.554	31.157
2.00 no cvd, low HFA, High T	1	2	5.884	4.505	.194	-3.020	14.789
		3	2.538	5.842	.665	-9.008	14.085
		4	-1.255	6.299	.842	-13.705	11.194
		5	.667	6.470	.918	-12.121	13.455
		6	24.787(*)	7.947	.002	9.080	40.495
		7	9.268	4.698	.050	-.018	18.553
	2	1	-5.884	4.505	.194	-14.789	3.020
		3	-3.346	5.431	.539	-14.080	7.388
		4	-7.140	5.546	.200	-18.103	3.823
		5	-5.217	5.752	.366	-16.586	6.152
		6	18.903(*)	7.440	.012	4.198	33.608
		7	3.383	3.963	.395	-4.450	11.216
	3	1	-2.538	5.842	.665	-14.085	9.008
		2	3.346	5.431	.539	-7.388	14.080
		4	-3.794	5.863	.519	-15.382	7.794
		5	-1.871	5.668	.742	-13.075	9.332
		6	22.249(*)	7.934	.006	6.567	37.930
		7	6.729	4.370	.126	-1.909	15.367
	4	1	1.255	6.299	.842	-11.194	13.705
		2	7.140	5.546	.200	-3.823	18.103
		3	3.794	5.863	.519	-7.794	15.382
		5	1.923	5.778	.740	-9.499	13.344
		6	26.043(*)	7.319	.001	11.575	40.510
		7	10.523(*)	5.229	.046	.189	20.858
	5	1	-.667	6.470	.918	-13.455	12.121
		2	5.217	5.752	.366	-6.152	16.586

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
		3	1.871	5.668	.742	-9.332	13.075
		4	-1.923	5.778	.740	-13.344	9.499
		6	24.120(*)	7.124	.001	10.039	38.201
		7	8.601	4.858	.079	-1.002	18.203
	6	1	-24.787(*)	7.947	.002	-40.495	-9.080
		2	-18.903(*)	7.440	.012	-33.608	-4.198
		3	-22.249(*)	7.934	.006	-37.930	-6.567
		4	-26.043(*)	7.319	.001	-40.510	-11.575
		5	-24.120(*)	7.124	.001	-38.201	-10.039
		7	-15.519(*)	7.013	.028	-29.381	-1.658
	7	1	-9.268	4.698	.050	-18.553	.018
		2	-3.383	3.963	.395	-11.216	4.450
		3	-6.729	4.370	.126	-15.367	1.909
		4	-10.523(*)	5.229	.046	-20.858	-.189
		5	-8.601	4.858	.079	-18.203	1.002
		6	15.519(*)	7.013	.028	1.658	29.381
3.00 CVD, low HFA	1	2	8.107(*)	3.711	.031	.771	15.442
		3	6.480	4.812	.180	-3.032	15.991
		4	31.024(*)	5.188	.000	20.768	41.279
		5	1.072	5.330	.841	-9.462	11.606
		6	35.805(*)	6.546	.000	22.866	48.744
		7	17.949(*)	3.870	.000	10.300	25.598
	2	1	-8.107(*)	3.711	.031	-15.442	-.771
		3	-1.627	4.474	.717	-10.469	7.216
		4	22.917(*)	4.569	.000	13.886	31.948
		5	-7.035	4.738	.140	-16.400	2.331
		6	27.698(*)	6.128	.000	15.585	39.812
		7	9.842(*)	3.265	.003	3.390	16.295
	3	1	-6.480	4.812	.180	-15.991	3.032
		2	1.627	4.474	.717	-7.216	10.469
		4	24.544(*)	4.829	.000	14.998	34.090
		5	-5.408	4.669	.249	-14.637	3.821
		6	29.325(*)	6.535	.000	16.407	42.243
		7	11.469(*)	3.600	.002	4.353	18.585
	4	1	-31.024(*)	5.188	.000	-41.279	-20.768

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	**(I) word**	**(J) word**	**Mean Difference (I-J)**	**Std. Error**	**Sig.(a)**	**95% Confidence Interval for Difference(a)**	
			Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**
		2	-22.917(*)	4.569	.000	-31.948	-13.886
		3	-24.544(*)	4.829	.000	-34.090	-14.998
		5	-29.952(*)	4.760	.000	-39.360	-20.543
		6	4.781	6.029	.429	-7.136	16.699
		7	-13.075(*)	4.307	.003	-21.588	-4.562
	5	**1**	-1.072	5.330	.841	-11.606	9.462
		2	7.035	4.738	.140	-2.331	16.400
		3	5.408	4.669	.249	-3.821	14.637
		4	29.952(*)	4.760	.000	20.543	39.360
		6	34.733(*)	5.868	.000	23.133	46.333
		7	16.877(*)	4.002	.000	8.966	24.787
	6	**1**	-35.805(*)	6.546	.000	-48.744	-22.866
		2	-27.698(*)	6.128	.000	-39.812	-15.585
		3	-29.325(*)	6.535	.000	-42.243	-16.407
		4	-4.781	6.029	.429	-16.699	7.136
		5	-34.733(*)	5.868	.000	-46.333	-23.133
		7	-17.856(*)	5.777	.002	-29.275	-6.438
	7	**1**	-17.949(*)	3.870	.000	-25.598	-10.300
		2	-9.842(*)	3.265	.003	-16.295	-3.390
		3	-11.469(*)	3.600	.002	-18.585	-4.353
		4	13.075(*)	4.307	.003	4.562	21.588
		5	-16.877(*)	4.002	.000	-24.787	-8.966
		6	17.856(*)	5.777	.002	6.438	29.275
4.00 no cvd, high HFA	**1**	**2**	14.794(*)	3.647	.000	7.587	22.002
		3	6.103	4.728	.199	-3.243	15.449
		4	24.674(*)	5.098	.000	14.596	34.751
		5	9.560	5.237	.070	-.792	19.911
		6	23.341(*)	6.432	.000	10.627	36.055
		7	18.810(*)	3.803	.000	11.294	26.326
	2	**1**	-14.794(*)	3.647	.000	-22.002	-7.587
		3	-8.691(*)	4.396	.050	-17.380	-.003
		4	9.879(*)	4.489	.029	1.006	18.753
		5	-5.235	4.656	.263	-14.437	3.968
		6	8.547	6.022	.158	-3.356	20.450
		7	4.015	3.208	.213	-2.325	10.356

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	(I) word	(J) word	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
	3	1	-6.103	4.728	.199	-15.449	3.243
		2	8.691(*)	4.396	.050	.003	17.380
		4	18.571(*)	4.745	.000	9.191	27.950
		5	3.457	4.588	.452	-5.612	12.525
		6	17.238(*)	6.422	.008	4.545	29.931
		7	12.707(*)	3.537	.000	5.715	19.699
	4	1	-24.674(*)	5.098	.000	-34.751	-14.596
		2	-9.879(*)	4.489	.029	-18.753	-1.006
		3	-18.571(*)	4.745	.000	-27.950	-9.191
		5	-15.114(*)	4.677	.002	-24.359	-5.869
		6	-1.332	5.924	.822	-13.042	10.378
		7	-5.864	4.232	.168	-14.229	2.501
	5	1	-9.560	5.237	.070	-19.911	.792
		2	5.235	4.656	.263	-3.968	14.437
		3	-3.457	4.588	.452	-12.525	5.612
		4	15.114(*)	4.677	.002	5.869	24.359
		6	13.782(*)	5.766	.018	2.384	25.179
		7	9.250(*)	3.932	.020	1.477	17.023
	6	1	-23.341(*)	6.432	.000	-36.055	-10.627
		2	-8.547	6.022	.158	-20.450	3.356
		3	-17.238(*)	6.422	.008	-29.931	-4.545
		4	1.332	5.924	.822	-10.378	13.042
		5	-13.782(*)	5.766	.018	-25.179	-2.384
		7	-4.531	5.676	.426	-15.751	6.688
	7	1	-18.810(*)	3.803	.000	-26.326	-11.294
		2	-4.015	3.208	.213	-10.356	2.325
		3	-12.707(*)	3.537	.000	-19.699	-5.715
		4	5.864	4.232	.168	-2.501	14.229
		5	-9.250(*)	3.932	.020	-17.023	-1.477
		6	4.531	5.676	.426	-6.688	15.751
5.00 CVD, High HFA	1	2	6.276	3.319	.061	-.285	12.837
		3	27.296(*)	4.304	.000	18.789	35.804
		4	29.051(*)	4.641	.000	19.878	38.224
		5	17.623(*)	4.767	.000	8.201	27.045
		6	39.150(*)	5.855	.000	27.577	50.723

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	**(I) word**	**(J) word**	**Mean Difference (I-J)**	**Std. Error**	**Sig.(a)**	**95% Confidence Interval for Difference(a)**	
			Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**
		7	28.526(*)	3.461	.000	21.684	35.367
	2	1	-6.276	3.319	.061	-12.837	.285
		3	21.020(*)	4.001	.000	13.111	28.929
		4	22.775(*)	4.087	.000	14.698	30.853
		5	11.347(*)	4.238	.008	2.970	19.724
		6	32.874(*)	5.481	.000	22.039	43.708
		7	22.250(*)	2.920	.000	16.478	28.021
	3	1	-27.296(*)	4.304	.000	-35.804	-18.789
		2	-21.020(*)	4.001	.000	-28.929	-13.111
		4	1.755	4.320	.685	-6.783	10.293
		5	-9.673(*)	4.176	.022	-17.928	-1.419
		6	11.854(*)	5.845	.044	.299	23.408
		7	1.229	3.220	.703	-5.135	7.594
	4	1	-29.051(*)	4.641	.000	-38.224	-19.878
		2	-22.775(*)	4.087	.000	-30.853	-14.698
		3	-1.755	4.320	.685	-10.293	6.783
		5	-11.428(*)	4.257	.008	-19.843	-3.013
		6	10.099	5.393	.063	-.561	20.758
		7	-.525	3.852	.892	-8.140	7.089
	5	1	-17.623(*)	4.767	.000	-27.045	-8.201
		2	-11.347(*)	4.238	.008	-19.724	-2.970
		3	9.673(*)	4.176	.022	1.419	17.928
		4	11.428(*)	4.257	.008	3.013	19.843
		6	21.527(*)	5.249	.000	11.152	31.902
		7	10.903(*)	3.580	.003	3.827	17.978
	6	1	-39.150(*)	5.855	.000	-50.723	-27.577
		2	-32.874(*)	5.481	.000	-43.708	-22.039
		3	-11.854(*)	5.845	.044	-23.408	-.299
		4	-10.099	5.393	.063	-20.758	.561
		5	-21.527(*)	5.249	.000	-31.902	-11.152
		7	-10.624(*)	5.167	.042	-20.837	-.411
	7	1	-28.526(*)	3.461	.000	-35.367	-21.684
		2	-22.250(*)	2.920	.000	-28.021	-16.478
		3	-1.229	3.220	.703	-7.594	5.135
		4	.525	3.852	.892	-7.089	8.140

Pairwise Comparisons Measure: Attent_Bias							
groupings_sorted	**(I) word**	**(J) word**	**Mean Difference (I-J)**	**Std. Error**	**Sig.(a)**	**95% Confidence Interval for Difference(a)**	
			Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**
		5	-10.903(*)	3.580	.003	-17.978	-3.827
		6	10.624(*)	5.167	.042	.411	20.837

Based on estimated marginal means

* The mean difference is significant at the .050 level.

a Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Note: Word Categories: 1 = Heart-High Threat; 2 = Heart-Moderate Threat; 3 = Heart-High Positive; 4 = Social-High Threat; 5 = Social-High Positive; 6 = Disaster-High Threat; 7 = Neutral

Appendix H

Data Sets

H1: Valence Rating of Final Words Lists –Pilot Study

H2: Experimental Data for Subliminal and Supraliminal Conditions

H1: Valence Rating of Final Words Lists –Pilot Study

CVD Participants

WORD	TYPE	Ss1R	Ss2R	Ss3R	Ss4R	Ss5R	Ss6R	Ss7R	Ss8R	Ss9R	Ss10R	Ss11R	Ss12R	Ss13R	Ss14R	Ss15R	Ss16R	Ss17R	Ss18R	Ss19R	Ss20R
ANGINA	1	2.5	2.5	2	1.5	1.5	2.5	1.5	1.5	3	1.5	2	1	2	2.5	2	1	2	1.5	2	2
CLOT	1	2	2.5	2	1	2	1.5	1	2.5	3	2.5	3	1	3	2.5	1	1	1	1	1.5	3
BLOCKED-ARTERY	1	1	1	1	2	2	1	2	3	2	2	1	1.5	1.5	2.5	1	1.5	2	1.5	1.5	2
CARDIAC-ARREST	1	1	1	1	1	2	1	1	1	1.5	3	2.5	1	1	1	1	1	1	1	1	2.5
CARDIAC-EMERGENCY	1	1	1	2	2	1.5	1.5	1	1.5	2.5	2	2	1	1	1	1	1	1.5	2	1	2
CHEST-PAIN	1	2	2	1	1	2	1	1.5	3	2	2	1.5	1	1	2	2.5	1.5	1	1.5	1	2
CORONARY	1	2	1	2.5	2	3	2	1	1.5	2	2.5	1	1	2	2	2	1.5	2	1	1	2.5
COLLAPSE	1	1	1	2	1	1.5	2	1	2.5	1	2	1	1	2.5	2.5	2	1	1.5	1	2	1
DEFIBRILLATION	1	1	1	2.5	1	1.5	2	2	1	1.5	1	2	1	2	2	2	1	1	1	1.5	2
CHOLESTEROL	1	2	3	2	3	3	2.5	2.5	1	1	3	1	1	2.5	1	2	1	2.5	1	2	2
HEART-ATTACK	1	1	1	1.5	3	2.5	2	3	2	1	2.5	2.5	1	1	3	3	2	2	3	1	1.5
POUNDS	1	2	2	3	2	2.5	3	2	2	1	1	2	1	2	2.5		2.5	2	2	3	2.5
HEART-FAILURE	1	1	1	1	1	1	1	1	1	2	1.5	1	1	2	1	1	2	1	1	1	1
HYPERTENSION	1	2.5	2	2.5	1	1.5	3	2	1	1	3	2	1	2	2.5	1	1.5	1	3	2	1
FLATLINE	1	1	1	1	1	1	1.5	1	1	1	1	1	1	1.5	1	2	2	1	2.5	1	1
ARRHYTHMIA	1	2	2	2.5	3	1.5	1	3	2	3	1.5	1	1	1	2	2	2.5	1.5	2	1	1
NUMB	1	1.5	2	3	2	2.5	3	2	2	2	3	1	1	1.5	1	3	2.5	1	1.5	3	2
PALPITATE	1	2	1	1	1.5	1	2	3	2	1.5	1	1	1	2	1	1	1	2	2.5	2	1
STROKE	1	1	2	1	1	1	1.5	1	1.5	1	2	1	1	1	1	1	2	1	1	1	1
ANEURYSM	1	1	2.5	1.5	1	2.5	1	1	2.5	1	1.5	1	3	1	1	1	1	2.5	1	1	1
HEART	2	5.5	5	5	4	5	5	5	4.5	3.5	4	4	5	5	5	5	4	5	5	5	5
BLOOD-VESSELS	2	4	4.5	3.5	4	4	4	3.5	4	3.5	5.5	3.5	6	5	4	4	4	4	3.5	4	3.5
HEART-VALVES	2	5	5.5	5	4	5.5	4	4	3.5	4	3.5	5	5	5	5	3.5	5	5	3.5	3.5	4
HEART-MONITOR	2	5	5.5	5	4.5	3.5	4	5	5	3.5	3	3.5	4	4	4	3	5	4.5	5	3.5	4
AORTA	2	4	4.5	4	3.5	5	5	5.5	3.5	4	5.5	5	5.5	4	3.5	3.5	4	4	3	4	4.5
HEART-MUSCLE	2	4	4	3.5	3.5	4	4	6	4	5	4	4	4.5	4	4	5	3.5	3.5	3.5	4	3
STETHOSCOPE	2	5	5	5	5	4	4	5	5	5	4.5	6	4.5	5	4	4	5	5	5	5	4.5
BEATS	2	3.5	4	3.5	4	3.5	5.5	2	3.5	4	5.5	5	3	1	5	4.5	5.5	5.5	5	5	2
PULMONARY-SYSTEM	2	5	4.5	5	5	4	4	4	5.5	3.5	4.5	5	5	4	5	4.5	3.5	5	4	4	6
THUMPS	2	3.5	3.5	3	3.5	3.5	5.5	3	5.5	3.5	5	5.5	4.5	2	3.5	5	5	3.5	3	5.5	5
PULMONARY	2	5	5	4	5	4	4.5	5	5	5	5	6	4	4	3.5	4	5	5	1	4.5	5
PULSATION	2	4	1	4	3.5	4	4.5	3.5	5	4.5	3.5	4	4	3.5	5	4	4.5	3.5	3.5	5	5.5
CARDIOVASCULAR	2	4	5	5	5	5.5	5.5	5	5	5	4.5	5	4.5	5.5	4.5	5	4.5	5	3.5	6	3.5
PULSE	2	4	5	4	6	5.5	5.5	4	6	5.5	6	3.5	5	5	5	5	4	5.5	3	5	5
ARTERY	2	4	5	3.5	3.5	5	5	3	3.5	3.5	3.5	4	3.5	4	3.5	4	2.5	4	3.5	4	3.5
BREATHING	2	4	5	6	5	5.5	4	4	7	6	5	5	5	4.5	5	5	5.5	5	5	4.5	4
OXYGENATED	2	5	5	6	5	6	5.5	4.5	5	5.5	4.5	5	3.5	3.5	3	3.5	5.5	4	4	4	3.5
VASCULAR	2	5	4	4	4.5	6	4.5	5	5	5.5	3.5	3	5	5	4	5	5	2	5.5	5	5.5
HEART RATE	2	3.5	5	4	3.5	4.5	4.5	4	1	1	7	4	4	1	4	3.5	5	6	4	3	5.5
HEARTBEAT	2	3.5	5	5	3.5	3	4	5	4	7	3.5	3.5	4	5	5	5	5.5	2	5.5	5	5
CUPID	3	8	8	9	7	8	7	8.5	9	8.5	7	8	8	8	7.5	9	8.5	8	8	5	8
HEARTFELT	3	8	9	9.5	8	6.5	7	8	9	6	10	8	10	8.5	7	8.5	7	8	8	7.5	9
GOOD-HEARTED	3	9	8	10	8.5	8	8	10	9	10	8	7	6.5	7	8	8	6	7	9	9	8.5
LOVE-HEART	3	9	8.5	9	10	10	7	8.5	8	7	10	6.5	5.5	6	8.5	8.5	6	10	10	8.5	8.5
HEARTTHROB	3	9	10	7.5	8	7	6.5	8.5	6	8	8.5	9	8	8.5	8.5	8	6.5	7.5	10	7.5	7.5
HEARTENED	3	9	8	9	10	8	8.5	8	6	8	7	9	10	5	8.5	9.5	8	9	9	7.5	8.5
HEART-WARMING	3	10	9	8	7	6	8	9.5	7	10	7.5	8	10	10	9.5	8.5	8	9.5	9	8.5	9
HEARTY	3	10	9	8	10	7	8.5	8.5	10	8.5	5	9	9.5	7	7	9.5	10	9	9	9	9.5
HEART-MELTING	3	10	8.5	9	10	7.5	9	7.5	10	10	7	8	7	7.5	7	10	7.5	10	8	8.5	9
LIGHTHEARTED	3	8.5	9	9.5	10	9	9	9	8	9	10	10	7	9	9	10	8	10	8	8	8.5
OPENHEARTED	3	8	8	10	8.5	10	7.5	10	8.5	10	9	7.5	8	8.5	9	8.5	10	9	9.5	9	8.5
PASSION	3	7.5	9.5	7	10	10	9.5	9	9	10	8.5	8	8	9.5	8	7.5	10	8.5	9	10	8
LIONHEART	3	9.5	10	7	8.5	8.5	9.5	6	10	7.5	8	7	8	9	9	10	9.5	8	8	10	9.5
HEARTLAND	3	9	8.5	8	7	10	9	10	8.5	10	10	9.5	10	10	8	8	7	0.5	8	9.5	10
VALENTINE	3	8.5	8.5	8	7	7.5	8.5	9	10	8.5	10	9	8	7.5	9	9.5	8.5	8.5	8	8.5	9
SWEETHEART	3	10	10	9	7	8.5	8	8	8	8.5	8	9.5	8	8	7.5	9	9	9	8	9.5	8
WARMHEART	3	10	8.5	8	9	10	10	9.5	10	10	10	9	8.5	8.5	7	9	6	8	10	8.5	10
HEARTS-DESIRE	3	9	9.5	9	10	9	8	10	8	7.5	8	8	10	9.5	8	9	10	9	9	9	7.5
WHOLEHEARTED	3	10	10	9	10	9.5	8.5	9	9	9	8	10	9	9.5	7	8	8.5	9	8.5	9	8.5
SOFT-HEARTED	3	8.5	7	9	10	10	8.5	9.5	9.5	9	9	8.5	9	9	8.5	8.5	8.5	9	9	9	8

WORD	TYPE	Ss1R	Ss2R	Ss3R	Ss4R	Ss5R	Ss6R	Ss7R	Ss8R	Ss9R	Ss10R	Ss11R	Ss12R	Ss13R	Ss14R	Ss15R	Ss16R	Ss17R	Ss18R	Ss19R	Ss20R
ACCEPTED	4	9	9.5	8	8.5	9.5	8	7	10	9	8	8	8	8.5	7	9.5	10	8.5	9.5	9	9
HIGH-ACHIEVER	4	10	10	9	10	9	9	8.5	9	9	9.5	9	10	9.5	10	9	8.5	9	10	8	9
ADMIRED	4	10	8.5	9	9	8	7	8	9.5	9	9.5	9.5	8.5	9	8	9	9	8.5	10	8	10
CHAMPION	4	10	8	8.5	9.5	10	10	9.5	8.5	10	9	9.5	9	8.5	8	9.5	8	9	9	10	8
COMPETENT	4	10	9	9	8	9	7.5	10	8	10	9.5	10	9.5	8.5	9.5	10	8	8	10	7	8.5
WELL-INFORMED	4	9	9	8	8	8.5	10	8	8.5	8.5	8	9.5		8	10	9	9	8	9	8	9.5
GIFTED	4	10	9	9.5	8	8	8	8.5	10	9.5	9	9.5	8	9.5	8	8	8.5	9	8	8	8.5
ESTEEMED	4	9	8.5	8	10	8	8.5	9	9.5	8	8	8	10	8.5	9	10		10	8.5	8.5	7
ADORABLE	4	9	6	8	7	10	10	8.5	10	8	9	7.5	8	8		8.5	10	7	9.5	8	10
KNOWLEDGEABLE	4	10	9	9	9.5	9	9	10	9.5	9	10	8.5	9	10	8.5	8		8.5	9.5	9.5	9.5
FIRST-PLACE	4	8.5	9	9	7	9.5	8	9	8.5	10	8	8.5	8.5	8	10	8.5	9.5	8	10	8	8
PROFICIENT	4	8	10	8	8.5	8	8	8	8	10	8	9.5	8	9.5	5	8	9	9.5	8	8	9.5
HIGHLY-SKILLED	4	9.5	10	8	8.5	7.5	8.5	9.5	8.5	10	8.5	8	10	8.5	7.5	9	10	8.5	8.5	9.5	8
SOCIALLY-SKILLED	4	10	10	8	8.5	10	9	8	8	10	8.5	9	10	9	10	8.5	10	8.5	8	10	8
SKILLED	4	9	10	8.5	9	9	9	9	8	8.5	9.5	8	8	8	8.5	9	9.5	8	8	9.5	8
SUCCESSFUL	4	8.5	10	8	9	9.5	8.5	7.5	10	10	10	8.5	9	10	10	8.5		8.5	9.5	8.5	9.5
INGENIOUS	4	9	10	9.5	10	10	10	8.5	8.5	8	7.5	8	10	10	8.5	10	9.5	8	10	8	10
WELL-LIKED	4	8	8	8	8	7.5	9	8.5	8	8	9.5	8.5	8.5	9	9.5	8	8	9	10	9	9
CHERISHED	4	9	8	7.5	9	10	8	8	10	8.5	9	9.5	9	8.5	5	8	8	10	7.5	9.5	9.5
DESERVING	4	8	8	10	9	9.5	8	7	9	8.5	7.5	9	8	8	8	9.5	8	9.5	10	9	8
ASHAMED	5	2.5	1	2	1	1	2	1	2.5	3	1	2.5	1	1.5	1	1.5	2.5	2	1	1.5	1.5
CRITICISED	5	1	1	2	1	2.5	2.5	1	1	3	3	1.5	1.5	2	2.5	2	2	2.5	1	1	1.5
LOSER	5	1	2.5	2	1.5	1	2	1	2	2.5	1.5	1	1	2	2.5	1	3	2.5	1	2.5	1
DESPISED	5	1	1	1	1	1.5	1	1	2	1	1	1.5	2	1	1	1.5	3	1	4	2.5	1.5
BLACK-SHEEP	5	2.5	3	2.5	2	3	2	1	2	2.5	1	2.5	1	1	3.5	1	3.5	1.5	2.5	1	1
HOPELESS-CASE	5	1.5	1	1	1	1	1	1	1.5	1	2	2.5	1	2	1.5	1.5	2	1.5	1	2.5	2
HATED	5	1	2.5	1	1.5	1.5	1	1	1	2	2	1	1	2	2	2	1	2	1.5	2	1
HUMILIATE	5	1	1	1	1	1.5	1	1	1	1	1	1.5	2	1.5	2.5	1	1.1	1.5	1.5	3	2
PUT-DOWNS	5	1	2.5	3	1.5	1	3	2	3	1.5	2.5	3	3	2	1	2	1.5	2	1	1	2.5
INADEQUATE	5	1	2	2	2	1	1	1.5	1.5	1.5	1	2	3	1.5	2.5	1	2.5	2	2	1.5	2
BORN-LOSER	5	2	1.5	2.5	1	1.5	3	2	1	1	1	1	1.5	2	1.5	1.5	2.5	1	3	1.5	1.5
MOCKED	5	2	1	1	1	1	1.5	1	1	1	1	2.5	3	2.5	1.5	2	1.5	1	25	15	3
SOCIALLY-FLAWED	5	2	2	2.5	3	1.5	1	3	2	3	1.5	2	2	1	2.5	1	1.5	2.5	4	2.5	1
OSTRACISED	5	2	1.5	1	1	2	2	1	3.5	1.5	1	1.5	2.5	2	1	2	3	2	1.5	3	1.5
FEEBLE-MINDED	5	2	1	1.5	1.5	2	1	1.5	3	2	2	1.5	1	1	2	1.5	1.5	1.5	2.5	2.5	2
TEASED	5	2	3	2	2.5	3	2	1	1.5	2	2.5	1	2	2	2	2.5	2	2.5	1	1.5	2.5
PATHETIC	5	1	1	2.5	1.5	1.5	2	1	2.5	1	2	1	1	2.5	2.5	2	1	2.5	2.5	1	3
UNPOPULAR	5	2	2	2	1.5	1.5	2	2	1	1.5	1	2	1	2	2	2.5	1.5	2	3	2	
USELESS	5	2	1	1.5	2	3	2.5	2.5	1	1	3	1	1	2.5	1	1.5	2	1.5	1	1	2
UNSUCCESSFUL	5	2	1	1	1	2.5	2	3	3	1	1	2.5	1	1	3	2.5	2	3	2	1.5	2
AVALANCHE	6	2	2.5	2	1.5	2.5	3	2	2	1	1	2	1	2	2.5	2.5	2	1	1.5	1	1.5
AIR-STRIKE	6	1	2	2	1.5	1	1	1	1	2	1.5	1	1	2	1	1.5	1	1.5	1	2	1
BOMBING	6	1	2	1.5	2	1.5	3	2	1.5	1	3	2	1.5	2	2.5	2	1	3	1.5	1	1.5
CYCLONE	6	2.5	2.5	2.5	2.5	1	1.5	1	1	1	1	1	1	1.5	1	1	2.5	1.5	1	1	2.5
CAR-ACCIDENT	6	2	2.5	2	1	1.5	1	3	2	3	1.5	1	1	1	2	2	1	1	3.5	1.5	3
DROWNING	6	1	1	1	2	2.5	3	2	2	2	3	1.5	1	1.5	1	1.5	2	2.5	2.5	2	2
EARTHQUAKE	6	2.5	1	1	1	2	1	1	2.5	2.5	2	1.5	1.5	2	2.5	1	3	2	3	2	1.5
ELECTROCUTION	6	1	1	2	2	1.5	1.5	1	1	1	3	1.5	1	5	2.5		1.5	1	1	2	1
FAMINE	6	1	1	2	2	1.5	1	1	1	1	1.5	1.5	1	1	1	1.5	3	2	1.5	2	2.5
FIREARMS	6	2.5	3	4	1	1	1.5	2	1.5	1	1	1.5	1	1	1		1	1	1	1.5	1
INFERNO	6	1	1	1.5	2.5	2	3		2.5	3	1.5	1	3	2	3	1.5	1.5	1	1	1	2
HURRICANE	6	3	2.5	3	1	2.5	1	3	3	1	1	1	2.5	2	1.5	1.5	3	1.5	1	1.5	2.5
MASS-MURDER	6	1	1	1.5	2	2	2.5	3	1	2	2	1.5	1	2.5	2	2.5	2	1.5	1.5	2	2
MINEFIELD	6	2	2	1.5	1	1	2.5	2	1.5	1.5	2	1	2.5	3	1.5	3	1.5	2.5	2	1.5	1.5
NUCLEAR-ACCIDENT	6	1	1	1	2	1.5	2.5	1	1	1.5	2.5	2	1.5	1.5	1	2	2.5	2.5	2	1	1
MURDERER	6	1	1	1.5	2.5	1.5	3	2	1.5	1	1.5	1.5	1	2	1.5	2	1	2.5	2.5	1	1
HAZARD	6	3	4	1.5	1.5	1	1	1	2.5	1	1.5	1	1.5	1	2.5	2	1.5	1	2	1	2
VOLCANIC-ERUPTION	6	2.5	3	1.5	1	3	2	1.5	1.5	2	2	2.5	1	1.5	1	1	1	1.5	1	1	2
STRANGLED	6	2	1	2	1.5	2.5	1	1	1.5	1.5	1	3	1.5	1.5	3	2.5	2	3	2	1	2
NUCLEAR-WEAPONS	6	2.5	3	3.5	3	4	2	1.5	1	2	2.5	1	1.5	1	1	1	1	1	1	1	1.5

Non-CVD Participants

WORD	TYPE	Ss1R	Ss2R	Ss3R	Ss4R	Ss5R	Ss6R	Ss7R	Ss8R	Ss9R	Ss10R	Ss11R	Ss12R	Ss13R	Ss14R	Ss15R	Ss16R	Ss17R	Ss18R	Ss19R	Ss20R
ANGINA	1	1	2	3	2	1.5	1	2	2.5	1	1.5	1	1.5	2	2	2.5	1	1	1.5	2	2.5
CLOT	1	1	1.5	1	1.5	1	2	2.5	1	1	2	1.5	3	1.5	1	1	3	2.5	5	1	1
BLOCKED-ARTERY	1	2.5	1	1	2.5	1	1.5	1	2	1	2	2.5	1	2.5	1	2.5	2	1	1.5	1	1.5
CARDIAC-ARREST	1	2	2.5	2	1	2	1.5	1	2.5	1	1.5	1	2	2.5	1	2.5	1	2	1	1	2.5
CARDIAC-EMERGENCY	1	1	1	1	2	2	1	2	1	1	1	2	2	1	1	1	1.1	1.5	1.5	3	2
CHEST-PAIN	1	1	1.5	1	1.5	2	1	1	1	2	1	1	1	1.5	2	1	1.5	2	2.5	1	2.5
CORONARY	1	1	1	2	2	1.5	1.5	1	1.5	2	3	1.5	2.5	3	3	2.5	2.5	2	2	1.5	2
COLLAPSE	1	2	2	1	1	2	1	1.5	3	1	1.5	1.5	1	2	3	1	2.5	1	3	1.5	1.5
DEFIBRILLATION	1	2	1	2	2	3	2	1	1.5	1	1	1.5	1	1	1.5	1	1.5	2	25	15	3
CHOLESTEROL	1	3	1	1	1.5	2	2	1	2	1.5	1	1	1	2.5	3	1.5	1.5	2.5	4	2.5	1
HEART-ATTACK	1	1	1.5	2.5	3	1	2.5	3	1.5	1	2	3	1.5	2	2	2.5	3	2	1.5	3	1.5
POUNDS	1	1	2.5	2	1	1.5	1.5		3	1	3.5	1.5	1	1.5	2.5	2	1.5	1.5	2.5	2.5	2
HEART-FAILURE	1	1	1.5	1	1	2	2	1	2	1.5	3	2	2	1.5	1	2	2	2.5	1	1.5	2.5
HYPERTENSION	1	1	2	1.5	2	1.5	1	1.5	1	2	1.5	1	2.5	1	1	1	1.5	2.5	2.5	1	3
FLATLINE	1	2	1	1.5	1.5	2	1	2	1	1	3	1	2	3	1.5	2.5	3	2	3	2	
ARRHYTHMIA	1	2	3	2	2.5	3	2	1.5	1.5	1.5	2	1	1.5	1.5	1.5	1	2	1.5	1	1	2
NUMB	1	1	1	2.5	1.5	1.5	2	1	2	1	1	1.5	1	1	1	1	1	3	2	1.5	2
PALPITATE	1	2	2	2	1.5	1.5	2	1	1	1.5	1.5	2.5	2	1	1	1	2.5	1	1.5	2	2
STROKE	1	2	1	1.5	2	3	2.5	1	3	2	2.5	2.5	1	2	3	1.5	2	1.5	1.5	3	1.5
ANEURYSM	1	2	1	1	1	2.5	2	2.5	1	1	2	1	1.5	3.5	1.5	1	1.5	2	4	1	1
HEART	2	5	5.5	6	5	5	5	4	5	5.5	4.5	5.5	5	4.5	5	5.5	5.5	5	5	5	5
BLOOD-VESSELS	2	4	4.5	4	3.5	6	3	4		4.5	5.5	5	3.5	5	5	5	6	5.5	5	5.5	4.5
HEART-VALVES	2	4	4	3.5	3.5	3	5	5.5	3.5	5	5.5	4	5	2	3.5	5.5	3.5	5	5	5	5
HEART-MONITOR	2	5	5	5	5	3.5	4.5	4	4	5	3.5	5.5	3.5	5	5	4	5.5	3.5	4	5	4.5
AORTA	2	3.5	4	3.5	4	4.5	5.5	3.5	5	4.5	5	5.5	3.5	4	4.5	5	4	6	5.5	4.5	5
HEART-MUSCLE	2	5	5	3.5	5	5.5	3.5	5	5	5	5	5	4.5	5	5	4.5	5	5	5	5	5
STETHOSCOPE	2	2	3.5	3.5	4	5	5	4	4	4	5.5	3.5	4	4	4.5	4	4.5	5	5	5	5.5
BEATS	2	4.5	5	5	4	5	3.5	3.5	5.5	3	5.5	3.5	5.5	3.5	4	5.5	5	5.5	5.5	5	5.5
PULMONARY-SYSTEM	2	5.5	3.5	4	3.5	5	5	4	4.5	5	5	5	6	4	5	4	4	4.5	4.5	5.5	3.5
THUMPS	2	5	4	4	4.5	5	3.5	4	4.5	3.5	5	4.5	5	5	5	4.5	6	4.5	5	3.5	5
PULMONARY	2	5	3.5	4.5	5	3.3	5	5.5	5.5	5	5	5	2	3.5	4	5.5	5	3	4	6	5.5
PULSATION	2	5	5	5	3.5		6	5.5	5.5	4	6	5.5	4	5.5	3.5	4.5	5	5	5	5	4.5
CARDIOVASCULAR	2	4.5	5	5	5	5	3.5	5	5	3	3.5	3.5	3	5.5	3.5	5	5.5	4.5	5.5	5.5	5
PULSE	2	5	3.5	4		4.5	5	5.5	4	4	7	6	5	5	5	5	6	4	4	4.5	4.5
ARTERY	2	6	5	4	5	3.5	5	6	5.5	4.5	5	5.5	3.5	5	4.5	3.5	4	4	5	5	5
BREATHING	2	5	4	3.5	5	5	4.5	6	4.5	5	5	5.5	4	4.5	4	3.5	5	5	4.5	4	5
OXYGENATED	2	5.5	3.5	5.5	5	5	5	5	4.5	5	5	5	4	4	3.5	3.5	5	4.5	5	5.5	3.5
VASCULAR	2	5	5	5	5		5.5	3.5	3.5	5	5	3.5	5	5	5	5	5.5	5	5.5	5	4
HEART RATE	2	4	6	5.5	5	5	3.5		3.5	4	5	5	5	4	3.5	4	4.5	5.5	5.5	4	5.5
HEARTBEAT	2	5	5	5	5	4	6	5.5	5	4	5	5	5.5	5	4	6	5.5	5	5	5	4.5
CUPID	3	7	9.5	10	8	8	9.5	6	8	7.5	8	10	10	9	8.5	8	10	7	7	9	8.5
HEARTFELT	3	9	10	9.5	9	7.5	9	10	8	9.5	8.5	8.5	9	9	8.5	9	10	6	10	9	7.5
GOOD-HEARTED	3	8.5	8	8	10	10	8	9	8.5	9	9.5	9	8.5	9.5	10	9	8.5	9	8.5	10	9.5
LOVE-HEART	3	9	8	7.5	8.5	10	9.5	10	9	8.5	10	8	8	10	8	9.5	8	9.5	5	9	8
HEARTTHROB	3	8	9	8.5	9	8	9.5	10	9	8	8	9.5	8.5	10	8.5	8	10	8.5	7.5	9	10
HEARTENED	3	9	10	9	7	8.5	8	9	8	8.5	7.5	8.5	8	10	8.5	9	10	9	10	9	8
HEART-WARMING	3	8	9.5	8	6.5	8.5	6	10	8	8.5	10	9	8	8.5	9.5	8	8	8	8.5	8	10
HEARTY	3	8	8	7.5	9	10	9	9	8.5	9	9	9	10	10	10	8.5	9	10	10	8.5	9.5
HEART-MELTING	3	7	9	8.5	8	8	8.5	10	8	9	9.5	8.5	8.5	8	8	8	10	10	8.5	10	9
LIGHTHEARTED	3	8.5	8	8.5	9	10	9	10	9.5	10	10	10	8	8	9.5	8.5	8.5	9	9.5	9	8
OPENHEARTED	3	10	8	8.5	10	9	8	8.5	8	8	7.5	9	10	8.5	9	9.5	9	8.5	5	10	
PASSION	3	9.5	9	8.5	10	8	9	8	7.5	9	10	7	9	8.5	7.5	9	8	8	8	9	10
LIONHEART	3	8	8	10	9	7.5	9	10	9.5	10	10	9.5	10	10	10	7	8.5	8	10	9	9
HEARTLAND	3	9.5	8.5	10	10	10	8	9	8	9.5	8	8	8	7.5	9	6.5	8.5	6	9.5	9.5	8.5
VALENTINE	3	8.5	8	10		10	9.5	10	9	10	8	7.5	9	10	8	8	7.5	9	10	10	10
SWEETHEART	3	10	10	9	7	8	7	8.5	9	8.5	8	10	9	9.5	8	8.5	10	8.5	9	8.5	9
WARMHEART	3	9	8.5	9.5	8	6.5	7	7	9	6	10	10	9	10	8	9	10	9.5	10	9	9.5
HEARTS-DESIRE	3	10	9	10	8.5	8	6	10	9	10	8.5	9	10	8	9	9	7.5	9	8.5	10	8
WHOLEHEARTED	3	9	8.5	9	10	10	7	8.5	8	7	9.5	10	9	8	9.5	7	10	7.5	8	10	8.5
SOFT-HEARTED	3	8.5	9	7.5	8	7.5	6.5	8.5	6	8	9	9	9.5	8.5	8.5	10	8.5	5	8.5	10	10

WORD	TYPE	Ss1R	Ss2R	Ss3R	Ss4R	Ss5R	Ss6R	Ss7R	Ss8R	Ss9R	Ss10R	Ss11R	Ss12R	Ss13R	Ss14R	Ss15R	Ss16R	Ss17R	Ss18R	Ss19R	Ss20R
ACCEPTED	4	8.5	8	9	10	9	8.5	7	6	7	8	8	8	9	7.5	10	10	7	8	8.5	9.5
HIGH-ACHIEVER	4	8	7.5	8	7	6	8	9.5	7	6.5	9	8	7.5	9	9	9	9	10	9.5	8.5	7
ADMIRED	4	10	9.5	8	10	7	8.5	8.5	9	8.5	10	9	9	7.5	10	8.5	10	9	9.5	8.5	9
CHAMPION	4	10	9	9	7.5	7.5	9	7.5	10	10	7	9	8.5	9.5	9	9	10	8.5	9	10	8.5
COMPETENT	4	8	8	9.5	10	9	9	9	8.5	9	8.5	10		9.5	6	10	7.5	8	10	9	9
WELL-INFORMED	4	8	7.5	8	10	10	10	9.5	8.5	10	10	8.5	10	9	10	10	10	8.5	9	10	8.5
GIFTED	4	8	9.5	8.5	8.5	9	8	8	8.5	7.5	9	9	9	10	8.5	8	10	8	10	8.5	8
ESTEEMED	4	8.5	9	9.5	9	8.5	8	7.5	9	10	8	9.5	8.5	9	8	8	9.5	8.5	8.5	8	9
ADORABLE	4	9	10	8	10	9	8	10	9	9.5	8	10	10	9.5	10	9	9	9.5	9	10	10
KNOWLEDGEABLE	4	10	8.5	10	8	9	8.5	10	9	9	0.5	10	10	8	9	8.5	7.5	9	8	7.5	9
FIRST-PLACE	4	9.5	9	10	9.5	10	8	10	8	8.5	9	8	9.5	9	10	8	9.5	9	9	9.5	10
PROFICIENT	4	8	8	8	8	8	8.5	10	8.5	8	10	8.5	9	8.5	9	7.5	9	8	10	8.5	8.5
HIGHLY-SKILLED	4	10	9	8	7.5	9	8	10	9	9.5	10	9	6	9	8.5	9	8.5	9	8.5	9	9
SOCIALLY-SKILLED	4	9.5	8	8	10	9	8	8.5	10	10	10	9	10	9	9	9.5	9	10	9	8.5	10
SKILLED	4	8	9	9	10	10	10	8.5	9	9	10	8	7	8	7.5	8	10	8.5	10	8	9
SUCCESSFUL	4	9	9.5	8.5	8.5	8	7.5	8	10	8.5	8.5	6	8	8	9.5	8.5	8.5	9	10	9.5	10
INGENIOUS	4	9	10	10	8	8	9.5	8.5	8.5	9	9	7.5	9.5	8.5	9	9.5	9	8	8	8	8
WELL-LIKED	4	8	9	10	10	8.5	9	9.5	9	8.5	9	9	9	8.5	9	10	8.5	9	8	7.5	9
CHERISHED	4	10	8.5	9	9	8.5	7.5	9	8	10	10	9.5	8.5	7	8.5	9	10	8	8	10	9
DESERVING	4	8.5	10	8.5	9.5	8	9.5	10	8.5	9	10	9	10	8.5	9	8	10	9	8.5	9.5	10
ASHAMED	5	1.5	1.5	1	2	2	1	1	1	2	2.5	1	1	1.5	2	1.5	2	1.5	2.5	1	1
CRITICISED	5	1	1	1	1	1	1.5	2	1.5	1	1.5	1	2	1	1	1	1.5	2	1	2.5	
LOSER	5	2	1	3	1.5	2.5	3	3	2	1	2	1	2.5	1.5	3	1	1	2	1	1	1.5
DESPISED	5	1	1	1.5	1.5	1	2	1.5	1	1	1	1	1.5	1		2	1.5	3	2	1	
BLACK-SHEEP	5	2	2	1	1.5	2	1	1.5	2.5	1.5	1.5	2	1	1.5	1.5	3	1	1	1.5	1.5	2.5
HOPELESS-CASE	5	1	1	1	2	1	2.5	3	2	1.5	1.5	2	1	1	1	1	2.5	1	1.5	1.5	1
HATED	5	1.5	1.5	2	3	1.5	2	2	1.5	2	3	2.5	2	1.5	1	1.5	1	2	1	1	1
HUMILIATE	5	1	1	3.5	1.5	1	1.5	2.5	1	1	2.5	2	2	1	3	1	1	1	1.5	2	2
PUT-DOWNS	5	2	1	3	2	2	1.5	1	1.5	1	1.5	2	2	2	1	1.5	2.5	1.5	2	1	1.5
INADEQUATE	5	2	3	1.5	2	2.5	1	2	1.5	1	1	1	2	1	1.5	1.5	1	2	1	1.5	1
BORN-LOSER	5	1.5	2	2.5	1	2	1	1	1	1	1.5	3	1.5	2.5	3	2	1	1	2	1	1
MOCKED	5	2	2	2	1.5	1.5	2	1	1	1	1	1.5	1.5	1	2	1	2	1.5	1	1.5	2
SOCIALLY-FLAWED	5	2	1	1.5	2	3	2.5	1	2	1.5	2	1	1	2	1	1	1.5	1	1	1.5	1
OSTRACISED	5	2	1	1	1	2.5	2	1	2	2	2	1	2.5	1	2.5	1	1		1	1	1.5
FEEBLE-MINDED	5	2.5	1	1	2.5	1	1	1	1.5	2	1	2	3	1.5	2	1	1.5	2	1.5	2	1
TEASED	5	1	2.5	3	3	2	1.5	2.5	3	1.5	1.5	3.5	1.5	1	1.5	1	1.5	1	1.5	1	1
PATHETIC	5	1.5	3	1	1	2	1	1	1	2	1	1.5	1	2	1	1.5	1	2	1	1.5	2.5
UNPOPULAR	5	1	1	1.5	1.5	1.5	2	1.5	1.5	1.5	2	2	1	1	2	2	1	1.5	1	1.5	1
USELESS	5	1.5	2.5	3	2	2	1.5	2	2	1.5	1	1	1	1	1	1	1.5	1	1.5	1	1
UNSUCCESSFUL	5	2.5	1.5	1.5	2	1.5	1	1	1.5	3	2	2.5	1.5	1.5	3	2	2.5	1	1.5	1	1.5
AVALANCHE	6	2	1.5	1.5	2	1.5	1.5	2.5	3	2	1	1	1	1	1.5	1	2.5	2.5	1	1.5	2.5
AIR-STRIKE	6	1.5	2	3	2.5	1	2	2	1.5	1	2	2.5	2	1.5	1	3	1	1.5	1	2	1
BOMBING	6	1	1	2.5	2	1	2.5	1	1.5	1.5	2	3	2	2.5	3	2	1.5	3	2.5	2.5	2.5
CYCLONE	6	2	1	1.5	1	2	2.5	1	5	3	1	1	1.5	1	2	3	2	2	1	1	2
CAR-ACCIDENT	6	2	2	1	2	2	1	1	1.5	2.5	2	1	1	1	1.5	1	1.5	2.5	2	1	2
DROWNING	6	1	1	1	2.5	1	1.5	2	2.5	1.5	2	1	1.5	2	1	1	1.5	1	1	2	3
EARTHQUAKE	6	1.5	3	3	1.5	2.5	3	3	2.5	1	1	2	2	1.5	1.5	2.5	3	2	2.5	2.5	1
ELECTROCUTION	6	3	1	1.5	1.5	1	2	3	1	1	1.5	2	1	1	1.5	1.5	1	2	1		1
FAMINE	6	2	1.5	1	1	1	1	1.5	1.5	2.5	3	1.5	1.5	2.5	3	3	2	2	2	2.5	
FIREARMS	6	1	1.5	1	1	1	2.5	3	2	2.5	2	1	2	1.5	2	2	1.5	1	1	1	2
INFERNO	6	2	1	2	3	1.5	2	2	1	2	3	2	1.5	1	1.5	1	1	1	1	1	1
HURRICANE	6	2	1.5	3.5	1.5	1	1.5	2.5	1	1.5	1	1.5	1	2	2	1	2.5	2	2.5	1	2.5
MASS-MURDER	6	1	1	1	2	2	1.5	1	2.5	1	1	2.5	1	1.5	1.5	2.5	2	2.5	1	1	1
MINEFIELD	6	1	1	1	1	1	1	2	2.5	1.5	2	1	1	1	1.5	2.5	1.5	1.5	2	1	1
NUCLEAR-ACCIDENT	6	2	2.5	1	1.5	3	2	1	1.5	2	2	3	1.5	2.5	3	2	1.5	1.5	2	1	2.5
MURDERER	6	1	1	1	1	1.5	1	1	1	1.5	1	1.5	1.5	1	2	1.5	2	3	2.5	1	1
HAZARD	6	2	2.5	3	1.5	1	3	1.5	2.5	3	1.5	1	1	1	1	1	1	2.5	2	2	1
VOLCANIC-ERUPTION	6	2	3	2	2.5	3	2	1	1	1.5	1.5	1	1	1	2.5	1	2.5	1		1	1.5
STRANGLED	6	1	1	1.5	1	2	3	1.5	2.5	3	1	2	3	1.5	2	2	1	2	2.5	2	1
NUCLEAR-WEAPONS	6	2	1	1	1	1.5	1	1	2	2.5	1.5	3.5	1.5	1	1.5	2.5	3.5	1	1	1	2

Appendix H2: Experimental Data for Subliminal and Supraliminal Conditions

NUMBER	AGE	GENDER (1=m, 2=f)	ENGLISH 1st (1=yes, 2=no)	CVD? (1=yes, 2=no)	OTHER ILLNESSES? (1=yes, 2=no)	MEDS (1=yes, 2=no)	HFA SCORE	FEAR	AVOIDANCE	HF ATTENTION	HFA ((L=1, H=2)	STAI-trait (20-80)	STAI-T (L=1, H=2)	MC-SD	TYPE (R = 1, TA =2, TLA=3, D=4)	DIAGNOSIS (0= NCVD, 1=ischemic Heart Disease, 2 =coronary heart disease, 3 = atrial fibrillation, 4= MI, 5=heart Arrythmia	DURATION (years)	SEVERITY (nil= 0, low = 1, medium/low=2 moderate=3, mediumhigh=4, high=5)	STAI-STATE	STAI -S (L=1, H = 2)	ANX1	ANX2	ANX3	DEP1	DEP2	DEP3	NART	GLASSES (1=yes, 2=no)	FAMILY HX CVD (1=yes, 2=no)
1	39	1	1	2	2	2	1.78	1.63	1.8	2	2	64	2	11	2	0	0	0	45	2	3	5	6	4	3	4	42	2	1
2	62	2	1	1	1	1	1.28	1.25	1.2	1.4	2	35	1	12	3	2	1	4	30	1	3	4	2	3	3	2	45	2	2
3	67	2	1	1	2	1	1.72	2.25	1.4	1.2	2	59	2	12	2	4	3	1	51	2	7	5	6	7	5	5	46	2	2
4	79	2	1	2	1	2	0.44	0.38	0.6	0.4	1	32	1	25	1	0	0	0	28	1	5	6	4	3	3	3	43	1	1
5	76	2	1	2	2	2	1.28	1.38	1.4	1	2	48	2	16	4	0	0	0	40	2	5	6	4	2	4	5	48	1	1
6	64	1	1	2	1	1	0.39	0.38	0.8	0	1	45	2	17	4	0	0	0	21	1	2	2	2	2	2	2	43	2	1
7	66	1	1	1	2	1	2.11	2.75	0.8	2.4	2	43	2	15	2	1	3	3	34	1	4	6	6	5	5	4	32	1	2
8	57	2	1	2	2	2	0.72	0.50	0.4	1.4	1	30	1	15	3	0	0	0	26	1	2	1	1	3	1	1	44	1	1
9	71	2	1	1	2	1	0.39	0.75	0.8	1	1	32	1	22	1	3	5	3	30	1	2	1	2	2	1	2	49	2	1
10	59	2	1	2	2	2	0.72	0.38	1.4	0.6	1	33	1	22	1	0	0	0	26	1	6	4	5	5	5	5	36	1	2
11	76	1	1	2	2	2	0.56	0.63	0.6	0.4	1	30	1	15	3	0	0	0	20	1	1	2	1	1	2	1	31	2	1
12	58	1	1	1	1	1	1.44	2.00	0.8	1.2	2	51	2	20	4	2	0.5	3	59	2	4	5	5	3	4	4	48	1	2
13	35	2	1	1	2	1	1.78	1.80	1.6	1.875	2	58	2	20	4	3	4.7	2	50	2	2	2	3	2	2	3	26	2	2
14	72	1	1	1	2	1	2.06	2.25	2	1.125	2	46	2	24	4	1	4	3	31	1	2	2	2	2	2	2	34	1	1
15	48	1	1	1	2	2	0.89	1.13	0.2	1.2	2	28	1	22	1	5	5	1	52	2	6	6	6	3	4	4	41	2	2
16	34	1	1	2	2	2	0.72	1.38	0.2	0.2	1	41	2	19	4	0	0	0	21	1	3.5	3.5	4	2.5	3	3	43	1	1
17	73	2	1	2	1	1	0.67	0.13	2	0.2	1	57	2	8	2	0	0	0	43	2	6	8	2	2	3	2	41	1	1
18	72	1	1	2	2	2	0.44	0.39	0.2	0	1	31	1	18	4	0	0	0	32	1	4	3	3	5	3	3	38	1	1
19	71	2	1	1	1	1	1.28	1.00	2	1	2	25	1	20	1	2	1	2	31	1	5	5	4	5	5	4	32	2	1
20	60	2	1	2	1	1	1.22	1.87	0.4	1	2	48	2	9	2	0	0	0	32	1	3	4	5	2	2	2	46	2	1
21	31	2	1	2	2	2	2.17	2.75	2	1.4	2	52	2	26	4	0	0	0	41	2	5	4	4	5	4	6	35	2	2
22	52	1	1	1	2	1	1.00	1.38	0.2	1.4	1	23	1	23	1	1	0.25	4	41	2	2	3	3	2	2	2	36	2	2
23	77	1	1	1	2	1	0.78	0.75	1.2	0.4	1	20	1	24	1	3	10	3	24	1	5	5	5	1	1	1	41	2	1
24	62	2	1	1	1	1	1.11	1.60	1	0.875	2	55	2	15	2	2	3	3	37	1	7	8	6	6	6	6	39	1	1
25	65	1	1	2	2	2	0.44	0.88	0.2	0	1	27	1	24	1	0	0	0	32	1	9	5	5	5	5	5	27	1	2
26	58	1	1	1	1	1	1.67	2.13	1.4	1.2	2	34	1	18	1	1	2	3	22	1	4	4	4	4	4	4	45	2	1
27	64	2	1	2	1	1	0.17	0.00	0.4	0.2	1	26	1	25	1	0	0	0	25	1	3	4	2	3	3	2	33	1	1
28	33	2	1	2	2	1	0.56	0.63	0.2	0.8	1	50	2	15	2	0	0	0	33	1	3	6	2	5	5	4	32	2	1

NUMBER	HRT-HT-SUB	HRT-MT-SUB	HRT-HP-SUB	SOC-HP-SUB	SOC-HT-SUB	DISASTER-HT-SUB	NEUT-NEUT-SUB	INCORRECT-SUB	1=IN, 2 OUT-SUB	Awareness Check	HRT-HT-SUP	HRT-MT-SUP	HRT-HP-SUP	SOC-HP-SUP	SOC-HT-SUP	DISASTER-HT-SUP	NEUT-NEUT-SUP	INCORRECT-SUP	1=IN, 2 OUT-SUP
1	10.24	1.00	-2.25	-4.75	16.34	25.56	2.00	5	1	0	14.22	3.23	-3.40	4.45	21.35	23.50	3.35	2	1
2	38.00	53.00	26.75	11.50	44.00	68.75	4.50	16	1	0	50.79	45.96	-31.54	9.62	18.01	-23.49	3.63	12	1
3	65.00	47.25	40.00	5.50	-19.00	-1.25	3.48	22	1	0	32.41	52.35	30.06	12.75	-12.46	2.40	-4.21	15	1
4	-89.25	-87.00	-54.25	33.50	-60.75	-35.25	44.00	37	2	0	99.75	55.13	-35.43	-38.57	-107.92	-54.08	148.93	176	2
5	-212.25		-227.50	685.50	451.00	-210.25	-47.50	67	2	0	-131.75		-184.50	232.47	456.83	-203.92	-47.50	27	2
6	6.25	19.50	1.75	30.00	-12.50	-7.75	4.50	9	1	0	-12.35	15.08	-0.02	33.63	-3.87	28.99	1.40	1	1
7	41.75	36.75	-19.00	-22.50	8.00	8.75	2.40	4	1	0	22.35	31.59	-27.63	12.52	10.82	23.45	25.46	4	1
8								260	2									55	2
9	29.25	18.50	6.25	-14.50	-8.50	-22.25	-1.75	3	1	0	12.70	-6.12	18.00	1.48	-10.59	-30.19	-1.23	10	1
10	-18.25	-35.50	6.00	38.00	23.00	-1.00	2.75	22	1	0	-21.52	33.10	-10.22	63.61	14.54	38.30	6.90	89	2
11	-22.75	-13.00	-1.50	14.25	-10.25	16.50	1.50	19	1	0	-21.14	-6.14	-4.81	35.50	-14.12	17.59	-1.13	5	1
12	35.50	25.00	37.00	23.75	-15.75	-0.75	-1.64	9	1	0	31.78	32.36	-26.52	26.18	-13.77	-11.46	-1.08	5	1
13	73.25	32.50	20.23	-5.50	13.50	12.25	6.57	1	1	0	24.63	39.99	7.95	-2.55	16.02	18.73	2.58	1	1
14	28.50	-1.50	139.00	-4.00	12.75	10.50	-37.25	64	2	0	151.13	-61.05	144.81	5.16	-27.19	65.01	-90.67	80	2
15	49.82	31.50	8.63	12.50	44.00	-51.25	-2.46	15	1	0	36.79	11.59	4.60	19.54	25.96	-24.36	-2.69	15	1
16	-1.75	-70.00	30.75	38.50	43.25	38.00	-3.70	15	1	0	36.26	-6.38	18.14	57.84	-31.35	30.09	-1.39	4	1
17	38.25	2.34	19.75	-26.50	28.50	-98.00	-1.75	21	1	0	32.03	1.46	27.82	-10.07	32.76	-94.82	2.25	11	1
18	-29.75	-20.25	12.00	83.25	6.75	43.25	-1.75	36	2	0	-92.00	-26.88	8.20	132.53	5.91	131.13	-199.67	43	2
19	31.25	26.67	58.25	4.25	-8.75	-9.50	-2.57	31	2	0	38.73	14.60	33.25	12.99	-14.32	-13.88	-14.43	35	2
20	18.25	2.75	-22.50	-5.50	-10.50	-15.50	1.20	7	1	0	12.32	-10.02	-13.39	5.55	-33.92	8.67	1.75	1	1
21	5.75	4.50	22.00	15.50	-18.00	-12.00	-2.10	6	1	0	11.50	3.65	21.45	13.63	0.57	-17.53	-2.10	4	1
22	4.67	4.40	34.75	65.50	-45.46	-50.34	-0.50	18	1	0	25.16	-5.38	10.85	35.78	50.81	7.91	-3.42	23	1
23	9.75	4.40	26.50	33.50	-14.25	-12.45	2.50	9	1	0	25.23	8.98	14.77	18.63	-10.73	-14.47	-0.60	2	1
24	50.75	30.25	21.00	9.00	14.50	-7.25	-0.50	16	1	0	30.82	31.78	13.15	2.98	1.03	-1.05	-1.83	20	1
25	-172.75	406.75	52.25	-165.25	64.50	119.50		78	2	0	51.21	302.75	128.15	-48.89	-77.42	-72.68		39	1
26	33.35	30.00	-0.75	-5.50	30.25	18.00	-1.75	5	1	0	11.66	30.88	-2.93	-12.65	-5.75	9.81	-1.27	7	1
27	-11.50	-6.90	-2.75	17.25	-10.25	-51.75	5.75	24	1	0	-7.75	-9.63	3.17	12.08	-17.39	-29.14	1.90	18	1
28	-2.50	12.50	3.50	-3.00	11.75	8.50	2.25	3	1	0	18.63	1.29	8.67	24.35	26.32	13.95	2.62	6	1

NUMBER	AGE	GENDER (1=m, 2=f)	ENGLISH 1st (1=yes, 2=no)	CVD? (1=yes, 2=no)	OTHER ILLNESSES? (1=yes, 2=no)	MEDS (1=yes, 2=no)	HFA SCORE	FEAR	AVOIDANCE	HF ATTENTION	HFA ((L=1, H=2)	STAI-trait (20-80)	STAI-T (lL=1, H=2)	MC-SD	TYPE (R = 1, TA =2, TLA=3, D=4)	DIAGNOSIS (0= NCVD, 1=ischemic Heart Disease, 2 =coronary heart disease, 3 = atrial fibrillation, 4= MI, 5=heart Arrythmia	DURATION (years)	SEVERITY (nil= 0, low = 1, medium/low=2 moderate=3, medium/high=4, high=5)	STAI-STATE	STAI -S (L=1, H = 2)	ANX1	ANX2	ANX3	DEP1	DEP2	DEP3	NART	GLASSES (1=yes, 2=no)	FAMILY HX CVD (1=yes, 2=no)
29	80	2	1	1	1	1	1.39	2.38	0.8	0.4	2	64	2	15	2	1	5	3	44	2	6	2	2	3	3	1	32	1	1
30	58	1	1	1	1	1	1.22	1.50	1.6	0.4	2	51	2	19	4	1	7	3	35	1	5	6	5	4	5	7	34	2	2
31	86	1	1	2	2	1	0.94	1.13	0.8	0.8	1	22	1	23	1	0	0	0	30	1	1	1	3	1	1	2	31	2	1
32	58	1	1	2	1	1	1.22	1.50	1	1	2	32	1	16	1	0	0	0	45	2	5	7	5	5	4	5	42	1	1
33	72	1	1	1	2	1	1.33	1.00	2	1.2	2	40	2	9	2	3	6	3	37	1	6	7	7	4	4	4	45	1	1
34	87	2	1	2	1	1	0.61	0.38	1.6	0	1	36	1	19	1	0	0	0	29	1	3	6	3	2	3	2	46	1	1
35	51	2	1	2	2	2	0.67	0.88	0.4	0.6	1	35	1	13	3	0	0	0	32	1	3	4	2	3	3	3	40	1	1
36	76	1	1	2	2	2	0.94	0.86	0.8	0.2	1	34	1	23	1	0	0	0	25	1	2	2	3	2	2	2	42	1	2
37	70	1	1	1	1	1	0.94	1.13	1	0.6	1	29	1	12	3	1	10	2	24	1	3	1	1	2	1	1	39	1	1
38	36	2	1	2	2	1	0.61	0.00	1.4	0.8	1	40	2	19	4	0	0	0	31	1	4	4	5	2	2	2	43	2	1
39	88	2	1	1	1	1	0.22	0.25	0	0	1	31	1	24	1	5	15	2	26	1	2	1	2	2	1	2	29	1	2
40	60	1	1	1	2	1	2.04	2.63	1.7	1.8	2	51	2	17	1	1	2	4	45	2	7	6	6	5	5	4	36	2	2
41	68	1	1	2	2	2	0.78	1.13	0.6	0.4	1	24	1	25	1	0	0	0	26	1	2	2	2	2	2	2	48	2	2
42	87	1	1	1	1	1	0.39	0.13	0.714	0.2	1	37	1	29	1	1	0.8	1	29	1	2	3	3	2	3	3	28	2	2
43	65	2	1	1	1	1	0.11	0.00	0.4	0	1	24	1	18	1	4	0.25	3	20	1	1	1	1	1	1	1	36	1	1
44	33	2	1	2	1	1	0.94	0.50	1.4	1.2	1	30	1	19	1	0	0	0	25	1	2	2	2	1	1	2	29	2	2
45	70	2	1	2	1	1	1.17	1.50	0.6	1.2	2	34	1	15	3	0	0	0	30	1	6	4	3	6	4	3	41	2	1
46	67	2	1	1	1	1	1.33	1.13	1.8	1.2	2	31	1	18	1	1	4	3	30	1	2	3	3	2	3	3	46	2	1
47	72	2	1	1	2	1	0.94	0.86	0.8	1.2	1	32	1	16	1	2	3	3	28	1	2	2	2	3	3	3	45	1	1
48	49	1	1	2	2	2	0.28	0.50	0	0.2	1	29	1	19	1	0	0	0	27	1	1	3	2	1	2	1	46	2	2
49	51	1	1	1	2	1	2.22	2.25	2.2	1.8	2	41	2	23	4	1	3	2	30	1	5	5	4	4	4	4	43	1	1
50	76	1	1	1	2	1	1.67	1.63	2	1.4	2	49	2	14	2	3	15	3	38	1	5	5	6	5	5	5	42	2	1
51	79	1	1	1	1	1	1.11	0.88	1.6	0	2	41	2	24	4	1	7	3	47	2	5	6	5	5	6	5	32	1	2
52	76	1	1	1	2	1	1.17	1.63	1	0.6	2	34	1	26	1	1	10.25	5	32	1	5	5	4	1	1	1	32	1	1
53	62	1	1	1	1	1	2.00	2.13	1.2	1.625	2	45	2	20	4	1	4	3	27	1	5	2	3	5	2	3	37	1	2
54	66	2	1	2	2	1	0.22	0.13	0.2	0.4	1	22	1	28	1	0	0	0	27	1	2	1	2	2	1	2	37	1	2
55	78	1	1	1	2	1	0.72	1.13	0	0.8	1	24	1	30	1	2	4	3	21	1	1	1	1	1	1	1	32	1	1
56	36	1	1	2	2	2	0.22	0.13	0.2	0.4	1	40	2	18	4	0	0	0	31	1	3	3	3.5	2	2	2	38	2	2
57	48	1	1	2	1	1	1.00	1.00	1	1	1	33	1	8	3	0	0	0	37	1	6	5.5	6.5	4.5	4.5	5.5	41	2	1
58	66	1	1	1	1	1	0.83	1.50	0	0.6	1	33	1	22	1	1	5	4	29	1	2	2	4	1	2	3	48	1	1

NUMBER	HRT-HT-SUB	HRT-MT-SUB	HRT-HP-SUB	SOC-HP-SUB	SOC-HT-SUB	DISASTER-HT-SUB	NEUT-NEUT-SUB	INCORRECT-SUB	1=IN, 2 OUT-SUB	Awareness Check	HRT-HT-SUP	HRT-MT-SUP	HRT-HP-SUP	S0C-HP-SUP	SOC-HT-SUP	DISASTER-HT-SUP	NEUT-NEUT-SUP	INCORRECT-SUP	1=IN, 2 OUT-SUP
29	60.75	-49.50	-71.00	-97.00	-31.75	-19.25	-1.75	66	2	0	65.14	-60.68	-5.83	-107.12	17.09	-30.68	29.60	29	2
30	20.75	4.75	-9.25	-4.50	-30.00	9.00	-4.42	4	1	0	-11.70	9.88	3.68	11.17	-39.47	17.42	-4.07	11	1
31	-18.50	-64.00	41.25	-52.50	95.75	-337.75	165.75	97	2	1	-134.77	-98.24	74.17	-158.49	105.40	-152.74	170.93	107	2
32	26.75	16.25	16.25	7.50	-2.25	-97.75	0.75	14	1	0	26.22	14.01	35.96	8.37	-5.70	-78.56	0.30	11	1
33	40.50	30.50	22.50	14.50	33.25	-33.75	1.90	14	1	0	30.53	30.02	-20.72	11.92	-23.46	-27.77	2.71	17	1
34	34.50	-38.75	34.50	26.50	-38.75	13.50	-3.25	22	1	0	62.99	-23.68	30.08	19.36	-49.59	-5.48	1.96	3	1
35	-22.25	-5.00	14.75	16.25	9.00	4.50	1.35	5	1	0	5.04	23.56	-14.99	7.89	30.07	23.56	1.08	1	1
36	-14.75	-35.25	56.25	46.00	-7.50	-22.00	0.90	24	1	0	-15.46	-23.27	41.90	30.75	-36.24	-8.15	2.38	3	1
37	20.25	19.00	16.75	18.75	-38.25	-40.50	6.50	6	1	0	19.48	11.59	14.12	18.28	-22.80	-27.48	2.70	6	1
38	-8.00	13.75	-1.30	6.75	37.00	-2.25	31.50	8	1	0	23.28	-9.54	-19.72	-67.03	-36.13	-20.65	2.02	12	1
39	43.25	73.25	12.25	99.75	-23.75	13.50	-61.25	51	2	0	60.61	130.43	84.08	103.71	-68.06	15.49	-1.71	18	1
40									2									54	2
41	-11.75	-4.75	9.25	23.00	-19.50	-27.75	2.25	4	1	0	-13.78	-5.92	15.22	13.46	-15.37	-28.63	0.21	13	1
42	4.25	-9.00	3.25	-42.75	10.75	-1.00	-2.50	12	1	0	16.90	5.13	-4.94	49.38	4.56	3.43	2.13	13	1
43	16.50	0.50	6.50	13.25	-12.50	-43.50	-1.50	5	1	0	13.73	-6.18	13.44	2.96	-7.95	-19.11	-1.50	7	1
44	-19.75	12.25	11.50	13.50	-11.00	-9.75	-5.25	5	1	0	-20.03	25.56	10.90	18.62	0.13	-14.17	2.17	2	1
45	22.25	28.75	-9.50	29.50	-16.25	-31.25	-0.25	13	1	0	25.19	17.18	-2.16	23.15	-12.72	-35.25	1.98	51	2
46	34.25	22.25	-3.25	36.75	28.00	-33.25	2.70	15	1	0	35.64	6.17	-7.99	33.68	28.59	-55.65	-1.30	3	1
47	-9.00	-28.25	-57.75	25.75	-11.50	-29.25	48.25	36	2	0	14.26	8.71	-11.89	70.79	6.86	-47.47	3.25	17	1
48	-12.25	2.75	9.50	29.50	-16.25	-31.25	-0.25	5	1	0	-15.19	-7.18	2.16	23.15	-12.72	-35.25	1.98	21	1
49	19.00	-24.50	2.25	-1.75	-203.00	-10.00	408.25	51	2	0	-1.09	-22.99	-65.75	16.04	-211.73	-80.36	398.08	42	2
50	58.75	29.50	10.00	22.00	-37.75	-4.50	2.98	5	1	0	53.78	38.20	6.64	-28.95	-18.54	-19.42	2.51	7	1
51	57.00	8.00	-124.00	169.25	72.00	-53.00	-190.00	64	2	0	-140.59	-59.70	-91.77	81.25	-53.46	-80.13	-146.15	65	2
52	20.10	34.75	11.75	69.75	-17.00	-7.00	3.75	14	1	0	6.20	-31.59	6.63	26.71	-26.76	-15.66	26.23	6	1
53	51.75	15.00	-5.10	11.75	-5.50	8.75	1.25	10	1	0	48.19	28.17	-5.06	-0.32	0.52	-1.65	3.57	4	1
54	-39.50	-2.75	-5.50	25.00	-26.25	-79.50	4.25	5	1	0	-37.71	-6.21	-5.61	10.59	-24.94	-50.02	1.58	15	1
55	26.75	29.00	24.00	20.25	-19.25	-23.50	-10.00	22	1	0	16.39	-26.92	-39.65	17.12	-38.18	-50.00	-5.00	4	1
56	10.50	10.00	26.75	-14.00	36.75	-8.50	2.75	5	1	0	-7.06	-2.39	-7.61	-33.28	22.68	-1.10	1.08	2	1
57	-53.50	-38.75	-14.00	21.75	-11.00	-23.50	-0.50	0	1	0	38.34	17.84	-18.82	18.60	-0.25	-24.72	-1.87	0	1
58	14.25	4.00	8.50	22.50	13.00	33.00	4.75	17	1	0	16.71	22.82	16.40	26.98	29.48	-20.44	2.15	6	1

NUMBER	AGE	GENDER (1=m, 2=f)	ENGLISH 1st (1=yes, 2=no)	CVD? (1=yes, 2=no)	OTHER ILLNESSES? (1=yes, 2=no)	MEDS (1=yes, 2=no)	HFA SCORE	FEAR	AVOIDANCE	HF ATTENTION	HFA (L=1, H=2)	STAI-trait (20-80)	STAI-T (L=1, H=2)	MC-SD	TYPE (R = 1, TA =2, TLA=3, D=4)	DIAGNOSIS (0= NCVD, 1=Ischemic Heart Disease, 2 =coronary heart disease, 3 = atrial fibrillation, 4= MI, 5=heart Arrythmia	DURATION (years)	SEVERITY (nil= 0, low = 1, medium/low=2 moderate=3, mediumhigh=4, high=5)	STAI-STATE	STAI-S (L=1, H = 2)	ANX1	ANX2	ANX3	DEP1	DEP2	DEP3	NART	GLASSES (1=yes, 2=no)	FAMILY HX CVD (1=yes, 2=no)
59	63	1	1	1	1	1	1.11	1.63	0.4	1	2	50	2	11	2	2	3	3	51	2	6	5	5	6	5	5	43	1	1
60	36	1	1	2	2	2	1.50	1.65	0.6	2.2	2	50	2	14	2	0	0	0	49	2	7	7	7.5	6	6	6	36	2	1
61	56	1	1	1	1	1	1.33	1.63	0.6	1.6	2	31	1	21	1	1	0.5	4	31	1	4	5	2	3	2	2	47	2	1
62	68	1	1	1	1	1	1.22	1.63	1.2	0.6	2	41	2	22	1	1	9	5	52	2	7	7	8	5	4	4	31	1	1
63	75	1	1	1	1	1	0.72	0.40	0.8	0.875	1	32	1	14	3	1	27	1	26	1	2	3	2	2	1	1	38	1	2
64	52	1	1	1	2	1	1.11	1.88	0.2	0.8	2	22	1	18	1	1	0.5	2	25	1	4	5	5	4	4	4	34	2	1
65	48	1	1	2	2	1	1.39	1.50	1.2	1	2	54	2	17	1	0	0	0	38	1	5	5	5	5	5	5	40	2	1
66	79	1	1	2	2	1	0.88	0.50	0.6	0	1	28	1	24	1	0	0	0	26	1	2	2	2	3.5	3	2	42	2	2
67	63	2	1	2	1	1	0.83	0.63	1.4	0.6	1	29	1	19	1	0	0	0	22	1	9	5	1	1	1	1	44	2	1
68	54	2	1	2	1	1	1.89	2.63	1.2	1.4	2	50	2	34	4	0	0	0	35	1	6	8	7	6	4	4	34	2	1
69	30	2	1	2	2	2	1.00	1.63	0.2	0.8	1	29	1	18	1	0	0	0	44	2	2	3	2	2	2	2	32	2	2
70	52	1	1	2	2	2	0.56	0.60	0.6	0	1	25	1	17	1	0	0	0	23	1	1	1	1	1	1	1	36	1	2
71	56	2	1	2	2	2	0.89	0.75	1.4	1.2	1	23	1	19	1	0	0	0	29	1	3	3	3	2	2	3	47	1	1
72	68	1	1	1	2	1	0.50	0.88	0	0.4	1	53	2	18	4	1	5	4	36	1	3	2	3	3	3	4	32	1	1
73	63	1	1	2	2	2	1.11	1.00	1.6	0.8	2	37	1	25	1	0	0	0	28	1	2	4	4	2	3	4	39	1	1
74	60	1	1	2	1	2	1.39	1.38	1.6	1.2	2	50	2	5	2	0	0	0	38	1	6	5	4	6	6	4	42	1	1
75	57	1	1	2	2	2	0.55	0.75	0.2	0.6	1	38	1	20	1	0	0	0	23	1	6	2	2	5	2	1	46	2	2
76	66	1	1	1	1	1	1.50	1.25	1.8	1.6	2	41	2	7	2	2	5	1	30	1	6	3	3	3	3	3	36	1	1
77	55	2	1	2	2	1	0.50	0.40	1	0.4	1	38	1	20	1	0	0	0	35	1	7	5	2	5	5	5	34	1	1
78	62	1	1	1	1	1	2.00	2.38	2.6	0.8	2	50	2	18	4	1	12	3	63	2	2	6	4	1	5	3	32	1	1
79	47	1	1	2	1	1	1.39	2.00	0.2	1.6	2	56	2	14	2	0	0	0	56	2	6	6	6	6	6	6	39	1	1
80	52	1	1	1	2	1	0.94	1.60	1	0.8	1	31	1	17	1	1	0.5	3	24	1	4	3	5	1	1	1	33	2	1
81	82	1	1	1	1	1	1.89	2.50	1.8	1	2	34	1	22	1	1	6	3	41	2	4	4	3	4	4	1	22	1	1
82	53	2	1	1	1	1	0.72	1.13	0	0.8	1	28	1	18	1	1	2.8	3	52	2	6	6	6	2	2	2	34	1	1
83	61	1	1	1	1	1	2.44	2.88	1.6	2.6	2	47	2	22	4	1	5	3	49	2	3	6	4	2	3	3	27	1	1
84	63	2	1	1	2	1	2.39	1.63	3.8	2.2	2	25	1	21	1	3	16	3	20	1	1	1	1	1	1	1	46	1	2
85	62	1	1	1	2	1	0.56	0.38	0.8	0.6	1	28	1	13	3	1	7.8	3	30	1	6	4	2	2	2	2	43	1	1
86	75	2	1	1	1	1	1.33	1.50	1	1.4	2	42	2	15	2	1	20	3	32	1	6	6	2	2	2	1	40	1	1
87	76	2	1	2	1	1	0.67	0.25	1.6	0.4	1	33	1	26	1	0	0	0	36	1	3	4	4	3	4	4	35	1	1
88	82	1	1	1	2	1	1.11	0.88	1.8	0.8	2	42	2	26	4	1	2.41	4	37	1	5	6	4	5	5	6	35	1	1

NUMBER	HRT-HT-SUB	HRT-MT-SUB	HRT-HP-SUB	SOC-HP-SUB	SOC-HT-SUB	DISASTER-HT-SUB	NEUT-NEUT-SUB	INCORRECT-SUB	1=IN, 2 OUT-SUB	Awareness Check	HRT-HT-SUP	HRT-MT-SUP	HRT-HP-SUP	SOC-HP-SUP	SOC-HT-SUP	DISASTER-HT-SUP	NEUT-NEUT-SUP	INCORRECT-SUP	1=IN, 2 OUT-SUP
59	34.00	12.00	25.75	57.25	-13.50	33.75	-0.64	9	1	0	-21.51	27.68	-30.31	38.74	29.78	27.89	-15.98	22	1
60	11.25	-11.50	-14.00	7.25	-11.00	-16.75	0.75	5	1	0	7.38	-2.87	-16.67	10.76	-19.65	-24.04	4.08	0	1
61	27.50	18.00	-14.75	-8.75	-12.25	15.25	-1.72	4	1	0	34.30	-4.43	-35.28	19.98	-19.11	11.51	-13.35	6	1
62	26.50	-17.50	-8.75	-82.00	35.75	29.50	24.00	32	2	0	3.40	-8.95	-16.12	-55.00	23.45	9.07	20.27	32	2
63	23.35	19.50	2.25	10.75	21.25	-22.25	2.50	12	1	0	20.48	12.13	9.38	15.78	-39.13	-24.43	2.22	7	1
64	22.25	13.25	28.75	-34.50	1.50	22.50	-1.48	6	1	0	19.85	4.93	31.77	20.58	32.10	22.50	-23.89	12	1
65	21.50	-10.50	0.50	25.50	16.25	2.50	1.75	1	1	0	21.81	-28.24	-2.58	15.43	10.47	4.90	1.85	1	1
66	-7.80	-14.75	-4.50	6.50	-47.00	-19.25	4.50	13	1	0	-6.67	-12.80	-10.28	11.00	-31.81	-49.29	1.78	11	1
67	-11.50	109.50	68.50	41.00	-10.75	27.00	195.25	52	2	0	6.15	58.19	139.38	71.92	-10.48	-39.23	160.90	56	2
68	11.00	12.25	34.25	22.50	11.75	-0.50	-3.50	9	1	0	15.43	11.98	41.27	24.25	-22.62	-7.28	-5.07	20	1
69	10.00	10.25	2.75	3.75	-12.25	-13.75	2.50	2	1	0	5.47	19.04	9.82	4.07	-1.98	-5.46	1.27	5	1
70	28.25	22.25	12.75	-24.75	-30.50	-48.50	3.75	6	1	0	23.08	23.33	7.15	-32.63	-22.40	-41.56	5.30	1	1
71	-24.50	-7.50	-2.75	10.75	-20.00	-97.50	4.00	9	1	0	-29.21	-7.43	-7.10	22.33	-26.71	-87.86	1.08	4	1
72	26.25	-5.75	3.50	19.00	-19.75	-23.50	1.40	3	1	0	-2.18	-0.82	24.67	18.53	-38.85	-16.92	4.30	12	1
73	24.50	33.00	8.75	16.25	-6.58	-42.50	-1.80	6	1	0	15.34	28.48	7.35	12.35	-12.79	-24.68	-4.37	7	1
74	-12.50	-23.25	37.75	24.00	-20.25	35.75	3.25	7	1	0	-6.42	-9.26	50.55	8.80	-3.88	34.88	0.58	11	1
75	-33.75	8.00	7.25	41.00	-13.00	-0.50	-1.25	5	1	0	-22.29	-0.02	5.39	20.16	-7.82	-11.15	1.77	4	1
76	-244.50	-325.00		-42.00	0.00	242.50		169	2	0	32.33	-240.70	394.75	-200.42	-78.90	105.79		190	2
77	-14.25	-6.25	26.25	-10.75	-2.50	20.50	3.53	2	1	0	3.60	-2.01	-20.71	-14.75	-14.22	20.61	2.55	7	1
78	33.50	5.50	5.50	6.00	11.25	-9.25	5.27	10	1	0	33.97	10.31	11.85	5.95	21.99	4.71	-45.48	9	1
79	24.75	2.00	16.00	36.50	-15.25	45.75	1.20	7	1	0	16.66	4.25	10.38	30.16	-8.74	31.12	3.44	4	1
80	15.75	8.75	9.50	26.75	-8.50	-54.25	-1.75	16	1	0	8.05	7.28	-5.19	11.93	-24.18	-73.64	-1.28	26	1
81	40.68	49.50	28.75	-71.50	3.50	2.75	1.30	24	1	0	40.57	38.87	35.52	-44.45	18.12	-41.60	68.08	24	1
82	24.25	16.00	13.75	14.75	-18.00	-18.50	4.75	8	1	0	16.14	29.91	6.46	20.00	-18.58	-27.36	2.29	2	1
83	68.50	48.25	4.25	13.25	39.75	10.00	-1.50	14	1	0	14.43	54.52	3.16	13.50	22.14	-10.82	-5.63	26	1
84	41.75	36.45	7.25	-7.50	17.25	19.00	6.50	3	1	0	27.59	20.14	2.62	17.43	-26.56	16.59	1.03	0	1
85	17.00	12.75	18.50	7.00	-20.00	-16.25	2.75	10	1	0	-12.43	4.77	25.31	12.30	-24.96	-23.94	-1.79	19	1
86	-122.25	-129.75	-5.50	73.00	25.25	-65.50	-1.90	36	2	0	-29.47	-122.95	-31.73	43.23	36.94	-116.10	-61.65	47	2
87	-22.50	-17.25	34.50	13.56	-25.75	-39.50	-2.75	11	1	0	-24.33	-17.98	5.73	27.26	-38.36	-13.37	-2.52	4	1
88	41.75	41.00	9.00	24.25	15.50	6.50	-8.50	21	1	0	29.74	15.02	3.27	24.84	12.04	-7.89	1.89	25	1

NUMBER	AGE	GENDER (1=m, 2=f)	ENGLISH 1st (1=yes, 2=no)	CVD? (1=yes, 2=no)	OTHER ILLNESSES? (1=yes, 2=no)	MEDS (1=yes, 2=no)	HFA SCORE	FEAR	AVOIDANCE	HF ATTENTION	HFA ((L=1, H=2)	STAI-trait (20-80)	STAI-T ((L=1, H=2)	MC-SD	TYPE (R = 1, TA =2, TLA=3, D=4)	DIAGNOSIS (0= NCVD, 1=ischemic Heart Disease, 2 =coronary heart disease, 3 = atrial fibrillation, 4= MI, 5=heart Arrythmia	DURATION (years)	SEVERITY (nil= 0, low = 1, medium/low=2 moderate=3, mediumhigh=4, high=5)	STAI-STATE	STAI -S (L=1, H = 2)	ANX1	ANX2	ANX3	DEP1	DEP2	DEP3	NART	GLASSES (1=yes, 2=no)	FAMILY HX CVD (1=yes, 2=no)
89	79	1	1	1	1	1	0.94	1.00	1	0.8	1	25	1	29	1	1	2	1	27	1	2	2	1	2	2	2	31	1	1
90	63	1	1	1	1	1	1.22	1.38	1	1.2	2	28	1	13	2	4	16	3	42	2	3	3	3	3	3	3	33	1	1
91	59	2	1	2	1	1	1.33	1.88	1.2	0.6	2	58	2	15	2	0	0	0	52	2	4	6	6	6	6	7	35	1	1
92	68	1	1	1	2	1	1.06	1.38	0.2	1.4	1	31	1	20	1	3	6	3	49	2	2	3	2	3	4	2	43	1	1
93	82	1	1	1	2	1	0.78	1.63	0	0.2	1	63	2	14	2	1	4	1	46	2	7	6	6	9	9	9	44	1	1
94	67	1	1	1	2	1	2.00	2.00	2.8	1.2	2	32	1	19	1	1	1.5	3	22	1	2	2	2	2	2	2	24	1	1
95	78	1	1	1	1	1	1.44	0.63	3.2	1	2	23	1	10	3	1	1	2	27	1	6	2	3	3	2	2	41	1	2
96	55	1	1	1	2	2	2.56	2.75	3	1.8	2	54	2	22	4	3	2	3	44	2	6	4	4	3	3	2	37	1	1
97	60	2	1	2	2	2	0.39	1.20	0	0.2	1	38	1	15	3	0	0	0	25	1	5	7	6	3	2	2	35	1	1
98	71	2	1	2	2	2	0.72	1.13	0	0.8	1	31	1	19	1	0	0	0	32	1	1	4	1	1	2	1	37	1	1
99	81	1	1	1	2	2	1.50	1.50	3	0	2	20	1	25	1	1	9	2	21	1	2	2	2	2	2	2	29	1	1
100	56	1	1	2	2	2	1.06	1.00	1.2	1	1	32	1	18	1	0	0	0	36	1	4	6	5	5	5	4	32	1	1
101	81	2	1	1	1	1	1.56	1.88	0.8	1.8	2	21	1	25	1	1	11	1	20	1	2	3	1	2	2	2	31	2	1
102	74	1	1	2	1	1	1.67	1.50	1.4	2.2	2	57	2	15	2	0	0	0	50	2	7	6	3	3	2	4	31	1	2
103	62	1	1	1	1	1	1.50	1.38	1.4	1.8	2	47	2	18	4	1	12	3	22	1	2	4	3	3	2	2	25	1	1
104	75	1	1	1	2	1	1.56	1.38	2	1.4	2	38	1	12	3	1	2	1	29	1	7	3	3	4	3	2	43	1	1
105	59	2	1	2	2	2	1.25	0.38	0.6	0.8	2	29	1	19	1	0	0	0	24	1	2	3	3	2	2	2	34	1	1
106	52	2	1	1	1	1	2.56	3.38	2.2	1.6	2	44	2	14	2	1	13	4	22	1	1	1	1	2	1	1	26	1	1
107	58	1	1	1	2	1	2.00	2.38	2	1.4	2	58	2	1	2	1	4	3	42	2	4	3	6	4	4	4	44	1	1
108	54	1	1	1	2	1	1.89	2.00	1.8	1.8	2	40	2	11	2	3	7	3	34	1	6	5	4	4	3	6	44	1	1
109	24	2	1	1	2	2	1.56	1.38	2.2	1.2	2	50	2	10	2	6	24	4	45	2	4	5	4	5	5	4	37	1	1
110	67	1	1	1	2	2	1.39	1.25	1.4	1.6	2	34	1	26	1	1	1.5	3	35	1	5	3	2	1	1	2	24	1	1
111	67	1	1	2	2	2	0.61	0.25	1.4	0.4	1	49	2	6	2	0	0	0	45	2	4	5	6	3	5	5	31	1	1
112	65	1	1	1	2	1	0.06	0.13	0	0	1	20	1	22	1	1	4	1	24	1	6	4	2	1	1	1	32	1	1
113	49	1	1	2	2	2	1.11	1.38	0.8	1	2	31	1	14	3	0	0	0	26	1	1	2	1	1	2	1	27	2	1
114	75	2	1	1	2	2	1.72	2.00	2	1	2	40	2	17	1	1	0.5	4	34	1	5	5	5	4	5	5	31	1	1
115	61	2	1	1	2	1	1.83	2.13	1.8	1.4	2	39	1	20	1	2	2.5	3	28	1	5	5	4	3	3	3	32	1	1
116	64	2	1	2	2	2	0.83	1.13	0.4	0.2	1	56	2	23	4	0	0	0	25	1	6	6	2	5	4	5	34	1	1
117	63	1	1	1	2	1	0.28	0.50	0	0.2	1	24	1	21	1	5	1.5	2	20	1	1	1	1	1	1	1	31	1	1
118	78	1	1	2	2	2	0.39	0.88	0	0.2	1	22	1	14	3	0	0	0	33	1	2	3	2	2	3	2	28	1	1

NUMBER	HRT-HT-SUB	HRT-MT-SUB	HRT-HP-SUB	SOC-HP-SUB	SOC-HT-SUB	DISASTER-HT-SUB	NEUT-NEUT-SUB	INCORRECT-SUB	1=IN, 2 OUT-SUB	Awareness Check	HRT-HT-SUP	HRT-MT-SUP	HRT-HP-SUP	SOC-HP-SUP	SOC-HT-SUP	DISASTER-HT-SUP	NEUT-NEUT-SUP	INCORRECT-SUP	1=IN, 2 OUT-SUP
89	8.00	-1.00	2.50	8.75	1.25	8.00	0.50	3	1	0	9.12	12.47	8.68	7.91	-15.09	9.87	0.58	12	1
90	34.46	21.75	25.85	2.75	31.00	49.50	-5.00	6	1	0	26.02	3.90	8.47	10.73	-38.19	-28.21	-8.73	0	1
91	20.75	11.50	67.75	17.25	-39.00	-29.50	0.56	8	1	0	20.64	1.99	73.35	20.08	-10.64	-7.91	0.65	6	1
92	32.25	22.49	7.00	37.25	-10.50	-10.25	6.75	10	1	0	14.62	5.21	5.34	20.76	-12.45	-14.28	1.29	10	1
93	-3.50	-6.00	16.25	25.75	-18.00	-25.75	1.50	2	1	0	-5.65	8.42	37.66	14.30	-16.97	-24.32	1.05	8	1
94	54.75	24.00	32.00	-11.00	20.25	-82.50	1.50	3	1	0	49.25	12.11	5.42	32.08	23.53	-46.90	-21.66	3	1
95	52.00	-86.25	67.25	50.50	25.75	-488.00	0.50	78	2	0	46.20	11.81	91.24	64.84	15.94	-225.56	-84.25	122	2
96	45.50	26.50	26.66	14.75	-17.75	-9.00	2.00	0	1	0	-10.36	20.06	-8.32	17.21	-19.79	-18.24	8.46	1	1
97	-48.25	-3.00	22.50	39.50	-12.25	-41.00	1.50	2	1	0	-33.65	-11.46	27.10	29.15	-14.65	-38.35	3.10	5	1
98	-121.25	-23.00	104.25	73.25	2.25	-57.25	55.25	66	2	0	-131.61	10.38	214.63	89.92	82.45	41.68	-30.47	90	2
99	59.50	30.00	-39.75	-72.75	25.75	-22.50	2.25	106	2	0	56.76	10.49	-17.38	-19.94	8.02	39.46	9.08	67	2
100	-26.00	-0.75	-6.00	15.75	-37.50	-25.75	-1.75	6	1	0	-16.09	7.95	-4.38	29.12	-32.76	-24.05	1.36	15	1
101	49.50	35.50	6.75	13.75	4.00	-16.00	-3.75	13	1	0	29.35	9.15	5.94	21.36	6.92	-11.22	-2.74	10	2
102	19.00	6.50	5.25	21.25	12.25	-12.00	0.75	14	1	0	14.14	4.80	1.58	11.78	15.98	4.42	3.04	26	1
103	45.50	28.60	23.25	31.75	-5.50	4.50	4.75	10	1	0	22.34	36.56	12.38	8.96	-2.87	-18.58	2.42	1	1
104	41.75	14.00	14.25	8.25	38.75	-76.75	1.25	14	1	0	10.11	6.69	19.85	7.75	21.44	-37.63	-4.13	24	1
105	36.75	35.75	17.25	-1.50	8.25	-53.50	2.40	6	1	0	35.48	28.10	3.58	-5.64	3.08	-31.06	2.03	5	1
106	43.56	36.75	19.00	2.50	8.00	18.75	2.40	4	1	0	42.35	31.59	17.63	2.52	10.82	23.45	2.55	0	1
107	68.00	51.00	42.25	15.50	-36.50	-26.25	3.75	1	1	0	66.10	48.40	26.14	8.50	-16.89	-27.39	3.00	6	1
108	48.50	22.00	13.38	13.50	34.75	18.50	0.25	7	1	0	47.18	25.04	16.15	5.03	14.29	-10.01	4.38	3	1
109	56.86	49.25	22.34	3.25	3.75	15.25	5.70	7	1	0	55.86	39.79	-8.77	14.18	-12.28	13.91	5.78	6	1
110	53.75	69.75	57.25	-13.50	44.00	-67.50	-158.25	42	2	0	1.23	7.99	163.59	-92.31	1.66	-31.81	-75.20	42	2
111	41.50	38.25	-52.00	-35.75	-8.25	-129.25	-91.50	41	2	0	-38.77	-61.72	51.29	-33.37	-32.33	-21.11	-165.49	45	1
112	7.75	5.25	30.75	11.25	-27.00	-36.25	5.00	3	1	0	8.40	14.81	19.04	12.71	-31.04	-33.47	0.63	3	1
113	-23.25	-21.50	-40.00	67.00	18.75	98.75	4.35	4	1	0	-23.68	-26.82	-18.71	59.76	20.35	121.20	3.69	2	1
114	50.75	31.25	26.25	16.75	-39.50	17.00	1.75	2	1	0	19.72	-1.41	-45.25	29.09	-17.66	-36.43	7.13	21	1
115	40.25	32.50	15.00	5.90	25.00	-53.75	6.00	6	1	0	39.33	32.93	6.80	7.89	-24.03	-54.25	4.20	4	1
116	31.75	23.75	25.00	42.50	47.75	-8.75	2.25	9	1	0	-23.39	-4.92	30.25	28.28	35.70	-55.61	4.11	1	1
117	-8.75	-50.25	65.25	63.50	-68.50	-24.50	81.25	30	2	0	-18.55	-65.76	68.78	133.89	-38.56	-10.26	82.82	43	2
118	-16.75	-15.75	13.50	13.50	-14.50	-6.25	2.25	25	1	0	-40.91	19.62	14.83	21.05	-23.03	-11.02	1.92	2	1

NUMBER	AGE	GENDER (1=m, 2=f)	ENGLISH 1st (1=yes, 2=no)	CVD? (1=yes, 2=no)	OTHER ILLNESSES? (1=yes, 2=no)	MEDS (1=yes, 2=no)	HFA SCORE	FEAR	AVOIDANCE	HF ATTENTION	HFA ((L=1, H=2)	STAI-trait (20-80)	STAI-T (L=1, H=2)	MC-SD	TYPE (R = 1, TA =2, TLA=3, D=4)	DIAGNOSIS (0= NCVD, 1=ischemic Heart Disease, 2 =coronary heart disease, 3 = atrial fibrillation, 4= MI, 5=heart Arrythmia	DURATION (years)	SEVERITY (nil= 0, low = 1, medium/low=2 moderate=3, mediumhigh=4, high=5)	STAI-STATE	STAI -S (L=1, H = 2)	ANX1	ANX2	ANX3	DEP1	DEP2	DEP3	NART	GLASSES (1=yes, 2=no)	FAMILY HX CVD (1=yes, 2=no)
119	74	1	1	1	1	1	0.39	0.88	0	0	1	20	1	28	1	2	15	3	21	1	2	2	2	2	2	2	31	1	1
167	67	1	1	2	2	2	0.61	0.25	1.4	0.4	1	51	2	16	4	0	0	0	34	1	5	4	4	2	2	2	43	2	1
168	87	1	1	2	1	1	0.83	1.50	0	0.6	1	47	2	6	2	0	0	0	45	2	8	9	4	3	5	5	35	1	2
169	54	2	1	2	1	1	0.94	0.86	0.8	1.2	1	52	2	13	2	0	0	0	49	2	6	7	2	4	4	4	42	2	2
170	52	1	1	2	2	2	0.22	0.25	0	0	1	43	2	4	2	0	0	0	23	1	4	7	6	2	2	2	30	1	1
171	45	2	1	2	2	2	0.55	0.75	0.2	0.6	1	47	2	12	2	0	0	0	24	1	7	6	3	3	2	4	31	1	1
172	63	2	1	2	1	1	0.39	0.88	0	0	1	55	2	18	4	0	0	0	51	2	8	8	6	6	6	6	34	1	1
173	72	2	1	2	2	2	0.83	0.00	1.5	0.6	1	51	2	3	2	0	0	0	43	2	7	2	2	3.5	3	2	32	2	2
174	80	1	1	2	2	1	0.39	0.38	0.8	0	1	54	2	17	4	0	0	0	52	2	7	7	6	5	4	4	34	2	1
175	69	1	1	2	1	1	0.78	0.00	1.625	0.2	1	43	2	15	2	0	0	0	19	1	4	6	4	2	2	2	29	1	2
176	74	2	1	2	1	1	0.44	0.00	0.2	0.875	1	52	2	5	2	0	0	0	38	1	5	3	7	5	5	5	45	2	1
177	61	2	1	2	2	2	0.56	0.63	0.6	0.4	1	47	2	18	4	0	0	0	43	2	5	2	2	3	5	5	37	2	1
178	74	2	1	2	1	1	0.28	0.50	0	0.2	1	53	2	13	2	0	0	0	28	1	2	2	4	2	3	3	41	1	2
200	64	1	1	1	1	2	2.56	3.38	2.2	1.6	2	50	2	14	2	2	4	3	30	1	6	5	4	2	2	2	40	1	1
201	58	1	1	2	2	2	1.67	1.50	1.4	2.2	2	58	2	11	2	0	0	0	52	2	7	6	3	3	2	4	32	1	2
202	89	1	1	2	2	1	1.78	1.63	1.8	2	2	48	2	15	2	0	0	0	45	2	7	6	6	4	4	4	42	1	2
203	87	2	1	2	1	1	1.67	1.63	2	1.4	2	49	2	14	2	0	0	0	38	1	5	5	6	5	5	5	42	1	1
204	62	2	1	2	2	2	1.33	1.00	2	1.2	2	40	2	9	2	0	0	0	37	1	6	7	7	4	4	4	45	1	1
205	79	1	1	2	1	1	1.89	2.50	1.8	1	2	34	1	22	1	1	6	3	41	2	4	4	3	4	4	1	22	1	1
206	59	2	1	2	2	1	1.89	2.00	1.8	1.8	2	40	2	11	2	0	0	0	34	1	6	5	4	4	3	6	44	1	2
207	69	2	1	2	2	1	2.56	3.38	2.2	1.6	2	50	2	14	2	0	0	0	54	2	6	6	4	2	2	3	40	1	1
208	79	2	1	2	2	2	1.83	2.13	1.8	1.4	2	39	1	20	1	0	0	0	28	1	5	5	4	3	3	3	32	1	1
209	57	2	1	2	1	1	1.67	1.63	2	1.4	2	54	2	26	4	0	0	0	46	2	7	6	6	5	5	5	42	2	1
210	64	2	1	2	1	1	1.39	1.20	1.5	1	2	37	1	24	1	0	0	0	24	1	4	4	4	1	1	1	34	1	2
211	68	2	1	2	2	2	1.78	1.63	1.8	2	2	51	2	23	4	0	0	0	34	1	5	6	4	5	5	5	37	1	1
212	68	2	1	2	2	1	1.56	1.38	2	1.4	2	38	1	12	3	0	0	0	29	1	7	3	3	4	3	2	43	1	1
213	57	2	1	2	1	2	1.17	1.63	1	0.6	2	34	1	26	1	0	0	0	32	1	5	5	4	1	1	1	32	1	1
214	76	2	1	2	2	2	1.89	2.00	1.8	1.8	2	40	2	11	2	0	0	0	34	1	6	5	4	4	3	6	44	1	1
215	58	2	1	2	2	2	1.83	2.13	1.8	1.4	2	39	1	20	1	0	0	0	28	1	5	5	4	3	3	3	32	1	1
216	68	2	1	1	2	2	0.61	0.25	1.4	0.4	1	24	1	6	3	1	4	3	24	1	4	5	6	3	5	5	31	1	1

NUMBER	HRT-HT-SUB	HRT-MT-SUB	HRT-HP-SUB	SOC-HP-SUB	SOC-HT-SUB	DISASTER-HT-SUB	NEUT-NEUT-SUB	INCORRECT-SUB	1=IN, 2 OUT-SUB	Awareness Check	HRT-HT-SUP	HRT-MT-SUP	HRT-HP-SUP	SOC-HP-SUP	SOC-HT-SUP	DISASTER-HT-SUP	NEUT-NEUT-SUP	INCORRECT-SUP	1=IN, 2 OUT-SUP
119	52.75	33.25	14.50	20.50	-13.75	-20.75	-1.10	48	2	0	15.20	41.75	14.78	16.67	-31.63	-22.66	34.45	13	1
167	15.67	6.50	2.40	8.76	12.70	-23.00	1.25	4	1	0	-12.45	-14.34	4.57	21.74	15.63	-12.37	0.25	0	1
168	30.45	9.47	5.43	15.37	27.60	-4.64	0.70	7	1	0	13.75	15.53	17.85	21.92	26.85	-27.95	-2.72	14	1
169	22.85	13.75	13.86	2.45	13.45	6.70	-1.05	12	1	0	10.92	7.86	12.36	6.65	14.70	-43.73	0.62	3	1
170	23.47	21.57	13.67	12.75	11.89	12.79	0.35	1	1	0	17.94	21.30	11.74	11.27	23.58	-31.63	3.73	5	1
171	21.75	23.68	7.49	3.47	34.57	-4.58	2.37	3	1	0	23.84	11.48	4.63	9.63	11.57	-14.74	1.26	6	1
172	17.74	7.45	4.63	13.42	19.65	23.57	0.65	18	1	0	14.54	11.57	5.22	9.64	-17.50	-11.26	0.50	7	1
173	4.57	7.54	19.39	17.36	26.27	-12.75	4.53	4	1	0	11.75	-4.63	8.96	13.46	-6.75	-17.88	1.95	21	1
174	35.63	29.54	8.53	6.30	12.64	23.55	-1.30	11	1	0	25.11	15.64	2.35	4.56	21.68	-23.81	3.52	1	1
175	41.79	32.87	32.85	15.64	45.75	34.53	4.35	9	1	0	12.14	17.37	11.75	19.58	32.57	16.42	-1.00	6	1
176	15.63	23.81	11.53	9.40	17.53	19.28	0.50	17	1	0	16.38	9.13	6.53	10.33	25.38	11.78	2.88	1	1
177	-7.47	-7.39	5.64	6.98	3.64	-14.85	0.71	3	1	0	-12.47	-9.26	9.01	15.48	5.63	-28.94	0.03	0	1
178	13.86	11.75	2.75	-3.95	12.54	14.69	-0.40	1	1	0	14.58	15.36	2.67	12.75	27.83	15.74	4.22	8	1
200	29.25	28.50	6.25	-14.50	-8.50	-22.25	1.34	9	1	0	22.70	-6.12	18.00	1.48	-10.59	-30.19	-13.23	10	1
201	54.75	24.00	32.00	-11.00	20.25	82.50	1.50	3	1	0	29.25	12.11	5.42	32.08	23.53	46.90	-1.66	3	1
202	24.25	16.00	13.75	44.75	-18.00	18.50	4.75	8	1	0	46.14	39.91	6.46	50.00	-18.58	27.36	2.29	4	1
203	49.75	10.75	67.75	-6.00	21.50	119.75	12.00	11	1	0	66.01	49.11	13.13	-27.08	4.63	62.92	10.75	3	1
204	33.50	22.25	16.00	13.75	-7.80	-6.00	1.25	5	1	0	7.74	16.71	11.73	9.73	-24.35	13.13	0.01	2	1
205	21.50	25.50	16.25	2.50	0.50	-40.50	1.75	3	1	0	1.81	15.43	10.47	4.90	-2.58	-28.24	1.85	11	1
206	41.00	17.25	12.25	-4.50	-39.50	-48.25	15.00	6	1	0	38.35	11.46	14.65	-3.44	-29.15	-33.65	35.10	23	1
207	41.75	38.75	74.25	8.25	-4.00	16.75	6.25	7	1	0	-10.11	-11.44	49.85	37.75	6.69	-37.63	-1.13	3	1
208	55.75	25.75	-3.50	-6.00	-16.25	-18.00	1.50	2	1	0	64.32	4.30	5.65	8.42	-37.66	-16.97	1.05	1	1
209	40.25	23.25	10.75	-1.00	-9.00	-42.75	-2.50	5	1	0	16.90	-4.94	4.56	3.43	5.13	-49.38	2.13	9	1
210	36.75	21.75	8.75	-22.50	8.00	-19.00	2.40	4	1	0	31.59	22.35	23.45	-2.52	10.82	-27.63	2.46	4	1
211	38.25	21.00	15.50	-3.00	8.50	10.00	5.46	11	1	0	32.03	5.82	21.45	-3.36	6.12	7.91	6.35	9	1
212	38.25	19.75	12.50	4.54	-17.79	-13.35	5.35	5	1	0	32.03	27.82	11.29	6.68	-12.35	-24.33	4.35	3	1
213	45.57	24.46	11.46	6.35	-12.32	-12.57	0.46	6	1	0	34.66	12.57	6.46	5.57	-15.57	-1.13	4.46	2	1
214	73.25	22.50	90.00	-5.50	3.50	12.25	1.25	1	1	0	24.63	-39.99	67.95	-25.55	16.02	18.73	1.58	4	1
215	54.75	24.00	32.00	-11.00	20.25	-82.50	15.50	3	1	0	29.25	12.11	5.42	32.08	23.53	-46.90	-2.66	3	1
216	16.35	8.46	7.47	24.35	-20.35	-34.35	-1.57	2	1	0	24.35	7.47	7.35	34.35	-6.44	-34.35	4.44	1	1

NUMBER	AGE	GENDER (1=m, 2=f)	ENGLISH 1st (1=yes, 2=no)	CVD? (1=yes, 2=no)	OTHER ILLNESSES? (1=yes, 2=no)	MEDS (1=yes, 2=no)	HFA SCORE	FEAR	AVOIDANCE	HF ATTENTION	HFA ((L=1, H=2)	STAI-trait (20-80)	STAI-T (IL=1, H=2)	MC-SD	TYPE (R = 1, TA =2, TLA=3, D=4)	DIAGNOSIS (0= NCVD, 1=Ischemic Heart Disease, 2 =coronary heart disease, 3 = atrial fibrillation, 4= MI, 5=heart Arrythmia	DURATION (years)	SEVERITY (nil= 0, low = 1, medium/low=2 moderate=3, mediumhigh=4, high=5)	STAI-STATE	STAI -S (L=1, H = 2)	ANX1	ANX2	ANX3	DEP1	DEP2	DEP3	NART	GLASSES (1=yes, 2=no)	FAMILY HX CVD (1=yes, 2=no)
217	58	1	1	1	2	2	0.72	1.38	0.2	0.2	1	24	1	19	1	2	3.4	3	21	1	3.5	3.5	4	2.5	3	3	43	1	1
218	78	2	1	1	1	1	0.56	0.63	0.6	0.4	1	30	1	15	3	4	5	1	20	1	1	2	1	1	2	1	31	2	1
219	67	2	1	1	2	1	0.28	0.50	0	0.2	1	29	1	19	1	2	4	2	27	1	2	3	2	1	1	1	43	2	2
220	81	2	1	1	1	1	0.44	0.38	0.6	0.4	1	32	1	25	1	1	5.3	3	28	1	5	6	4	2	3	3	38	1	1
221	49	1	1	1	2	1	0.67	0.25	1.6	0.4	1	33	1	17	3	3	0.7	1	36	1	6	2	2	3	2	2	36	1	1
222	59	2	1	1	2	1	0.61	0.38	1.6	0	1	36	1	19	1	1	2	2	29	1	3	6	3	2	3	2	46	1	1
223	67	2	1	1	1	1	0.56	0.60	0.6	0	1	24	1	12	3	5	12	2	31	1	4	4	4	5	5	5	39	1	2
224	45	2	1	1	2	1	0.61	0.38	1.6	0	1	33	1	7	3	3	3.7	3	24	1	5	5	2	2	2	2	32	2	2
225	87	2	1	1	1	1	0.89	0.75	1.4	1.2	1	32	1	19	1	1	7	2	34	1	3	7	4	3	4	4	39	1	1
226	67	2	1	1	1	1	0.39	1.20	0	0.2	1	34	1	23	1	2	6	3	26	1	5	4	4	6	5	5	41	2	2
227	71	1	1	2	1	1	0.55	0.20	0.75	0.6	1	34	1	17	1	0	0	0	24	1	2	2	2	2	2	2	34	2	2
228	65	1	1	2	2	2	0.89	0.75	1.2	1.4	1	24	1	20	1	0	0	0	35	1	7	6	5	5	5	5	41	1	1
229	82	1	1	2	1	2	0.94	1.00	1	0.8	1	30	1	6	3	0	0	0	25	1	6	6	2	4	3	4	39	1	1
231	49	1	1	2	2	2	0.94	0.86	0.8	1.2	1	34	1	17	1	0	0	0	34	1	5	4	4	6	5	5	41	1	1
233	71	1	1	2	2	2	0.11	0.40	0	0	1	22	1	15	3	0	0	0	27	1	6	6	5	6	6	6	34	2	1
234	78	1	1	2	1	1	0.89	0.75	1.4	1.2	1	39	1	23	1	0	0	0	36	1	5	3	3	3	3	2	34	1	1
235	67	1	1	2	1	1	0.44	0.38	0.6	0.4	1	25	1	17	1	0	0	0	34	1	7	8	4	2	2	2	32	1	1
236	64	1	1	2	1	1	0.61	0.38	1.6	0	1	31	1	21	1	0	0	0	34	1	1	1	1	1	1	1	38	2	2
237	67	1	1	2	2	2	0.94	1.13	1	0.6	1	34	1	18	1	0	0	0	25	1	2	5	5	3	3	3	48	2	1
238	78	1	1	2	1	2	0.72	1.13	0	0.8	1	29	1	23	1	0	0	0	29	1	5	4	4	7	7	7	31	1	1
239	67	1	1	2	2	2	0.39	0.13	0.714	0.2	1	38	1	20	1	0	0	0	37	1	7	5	5	1	1	1	34	1	1
240	82	1	1	2	1	1	0.67	0.25	1.6	0.4	1	27	1	20	1	0	0	0	34	1	3	3	3	5	5	5	44	1	1
241	76	1	1	2	2	2	0.39	0.80	0.75	1	1	31	1	12	3	0	0	0	26	1	7	5	2	5	5	5	39	1	1
242	67	1	1	2	2	2	0.61	0.25	1.4	0.4	1	36	1	25	1	0	0	0	51	2	3	7	4	3	4	4	41	1	1
243	78	1	1	2	1	1	0.83	1.13	0.4	0.2	1	27	1	15	3	0	0	0	25	1	2	2	2	1	1	1	31	1	1
245	78	1	1	2	1	1	0.39	1.20	0	0.2	1	30	1	17	1	0	0	0	23	1	6	2	2	2	2	2	38	2	1
246	58	1	1	2	2	2	0.72	1.38	0.2	0.2	1	32	1	21	1	0	0	0	34	1	1	7	6	4	4	3	40	2	1
247	68	1	1	2	2	2	0.39	0.75	0.8	1	1	26	1	19	1	0	0	0	38	1	7	5	2	5	5	3	32	1	1
248	49	1	1	2	2	1	0.78	1.63	0	0.2	1	38	1	20	1	0	0	0	32	1	3	4	2	7	4	4	37	1	1
249	63	1	1	2	2	2	0.72	0.80	0	1.125	1	36	1	16	1	0	0	0	30	1	5	5	5	5	5	5	31	1	1

NUMBER	HRT-HT-SUB	HRT-MT-SUB	HRT-HP-SUB	SOC-HP-SUB	SOC-HT-SUB	DISASTER-HT-SUB	NEUT-NEUT-SUB	INCORRECT-SUB	1=IN, 2 OUT-SUB	Awareness Check	HRT-HT-SUP	HRT-MT-SUP	HRT-HP-SUP	SOC-HP-SUP	SOC-HT-SUP	DISASTER-HT-SUP	NEUT-NEUT-SUP	INCORRECT-SUP	1=IN, 2 OUT-SUP
217	35.46	23.32	34.35	5.33	5.35	34.35	4.35	5	1	0	36.33	11.23	29.35	16.35	14.35	34.32	2.46	4	1
218	12.23	9.23	13.23	26.32	-23.32	-23.35	1.35	8	1	0	23.35	14.44	15.44	24.35	-25.35	-12.35	1.35	7	1
219	23.35	17.55	12.46	3.35	5.44	24.46	2.35	14	1	0	16.46	16.46	11.35	14.44	6.35	-27.44	-1.33	5	1
220	29.25	11.23	15.25	3.50	60.75	15.25	4.40	3	1	0	19.75	15.13	13.35	6.47	45.35	9.32	1.35	10	1
221	0.50	-7.25	4.50	21.00	-25.75	-39.50	4.32	11	1	0	24.33	17.98	5.73	27.26	-38.36	-13.37	-1.35	15	1
222	34.50	18.75	34.50	26.50	-18.75	-13.50	-0.35	16	1	0	19.99	13.68	30.08	19.36	-49.59	-5.48	-1.96	12	1
223	24.35	15.32	7.44	6.44	-15.35	-39.00	2.23	2	1	0	38.35	43.44	9.45	9.44	-37.35	-34.35	3.34	7	1
224	23.35	16.32	14.35	8.46	25.44	-14.23	1.23	8	1	0	24.23	15.23	8.43	9.35	-15.23	-12.24	1.35	9	1
225	45.34	24.32	18.35	8.35	25.34	19.35	5.45	12	1	0	16.43	12.35	13.22	7.35	-34.35	-34.24	-2.32	6	1
226	44.34	21.32	25.44	18.44	7.35	18.32	2.32	14	1	0	70.43	24.36	17.35	13.32	15.44	23.32	2.44	2	1
227	-14.56	-12.23	3.32	10.56	-25.55	-12.32	2.35	2	1	0	-34.32	-17.35	5.32	-16.46	-23.32	-13.23	2.35	23	1
228	-5.57	-6.25	4.35	12.34	-5.35	-34.23	2.44	7	1	0	-32.32	-23.24	7.35	5.35	-3.23	-2.21	1.35	37	2
229	-23.32	-24.32	-2.32	13.35	-34.35	-23.35	-2.55	6	1	0	-53.00	-15.35	-3.35	12.32	-12.53	-25.00	0.45	17	1
231	-12.55	-12.45	15.54	5.43	-12.12	-13.13	1.35	12	1	0	-23.12	-35.23	2.33	-12.24	-3.24	-3.24	5.35	17	2
233	-37.91	-15.66	8.85	13.54	-34.53	-17.64	2.27	1	1	0	-34.46	-21.35	5.35	12.85	-5.65	-4.75	-1.58	1	1
234	-14.95	-23.49	4.50	23.98	-22.39	7.47	-3.47	5	1	0	-34.45	-14.37	6.44	16.46	-6.30	-27.38	-6.49	1	1
235	-11.59	-12.01	23.53	16.36	-13.52	-9.44	2.00	2	1	0	-26.59	-13.55	14.35	18.85	-7.39	-17.64	-1.60	4	1
236	-8.92	3.43	5.40	9.43	-5.49	-6.38	0.22	14	1	0	-10.02	-3.60	6.94	10.56	-7.49	-8.58	2.75	4	1
237	-17.00	-4.28	-6.85	8.50	-12.59	-16.83	2.75	0	1	0	-10.53	1.64	8.65	9.64	-13.98	-12.97	3.90	15	1
238	-22.54	-6.79	13.95	14.49	-25.58	-36.59	3.76	6	1	0	-31.88	-11.64	16.75	21.74	-3.74	-42.90	-1.76	11	1
239	-14.77	-12.28	-1.26	17.89	-16.78	-12.77	-4.00	2	1	0	-17.48	-13.66	3.52	20.57	-20.70	-16.65	-0.11	0	1
240	-12.34	-18.94	2.93	5.65	-15.78	-14.84	4.00	9	1	0	-23.74	-16.93	4.54	2.77	-11.65	3.00	2.54	3	1
241	-56.89	-34.44	12.99	4.43	-67.73	-87.66	-5.31	11	1	0	-41.90	-32.96	6.78	12.95	-45.80	-74.90	-2.00	13	1
242	-16.36	-2.78	6.80	3.00	-21.93	-13.65	-0.22	21	1	0	-7.43	-4.54	5.68	4.65	-13.57	-5.66	-3.50	5	1
243	-34.50	-13.57	7.55	8.56	-43.89	-45.58	5.76	13	1	0	-53.67	-23.49	10.90	5.66	-34.57	48.99	6.46	7	1
245	-13.55	-15.39	0.35	3.54	-17.75	-7.46	2.11	2	1	0	-18.46	-18.32	3.36	5.38	-12.34	-21.56	3.56	1	1
246	-17.48	-12.45	2.45	19.00	-18.99	-25.77	2.36	2	1	0	-12.64	3.45	4.47	3.28	-23.87	-29.46	5.44	20	1
247	-45.38	-23.55	3.55	5.38	-51.38	-57.48	1.44	5	1	0	-34.83	-17.66	18.38	17.32	-47.61	-72.35	2.54	12	1
248	-13.57	-16.46	1.25	23.56	-18.40	-24.57	-3.28	3	1	0	-7.39	3.00	-7.48	10.28	-19.54	-21.56	-1.23	2	1
249	-39.23	-22.30	6.49	12.54	-13.53	14.53	0.43	10	1	0	-17.43	-16.53	5.74	24.86	-25.75	-12.97	0.42	3	1