An Experimental Investigation of Existential Concerns in Point-of-Care Testing for Cardiovascular Disease Using a Terror Management Theory Framework

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Declaration

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List of Abbreviations:

BDI = Biomedical Diagnostics Institute

CAB = Cultural Anxiety Buffer

CVD = Cardiovascular Disease

DTA = Death Thought Accessibility

GP = General Practitioner

POCT = Point-of-Care Testing

TAA = Thioamine Acetylase

TMHM = Terror Management Health Model

TMT = Terror Management Theory

Abstract

Recent research in Terror Management Theory (TMT) has found that mortality reminders below conscious awareness can lead to avoidant responses towards cancer-screening. Following this, the current research programme used a TMT framework to evaluate if mortality reminders could result in analogous responses towards a novel device for indicating Cardiovascular Disease (CVD) risk; the "CVD Risk Biochip". Three central studies (Studies 1, 2 and 4) were designed to examine if various mortality reminders would elicit more avoidant responses towards the "CVD Risk Biochip" than control topics. The third of these studies (Study 4) also investigated whether or not the nature of the device itself served to dissociate an individual towards CVD, thereby moderating existential concerns. An additional study (Study 3) examined whether or not one of the mortality reminders from the first two studies (Heart Attack Salience) leads to the suppression of death-related thoughts. When taken together, the results of these studies demonstrate that devices like the CVD Risk Biochip may have a beneficial effect on the potential uptake of screening behaviours generally and highlight the potential for cross-cultural variability in responses towards TMT methodologies. The findings of the programme also suggest some unique recommendations for the future study of TMT, including the performance of initial qualitative investigations of the cultural worldviews of a particular cohort before examining TMT processes and the necessity of controlling for the confounding effects of word frequency and word ambiguity in future "death-thought accessibility" research.

Chapter 1: General Overview of the Current Research Programme

Despite the fact that humans arguably possess a strong biologically wired self-preservation instinct, people frequently make health decisions that have the potential to compromise their well-being. For example, people often engage in behaviours that are risky such as dangerous driving, unsafe sex and the use of tanning beds; or avoid health-protective behaviours like failing to attend their General Practitioner (GP) regularly or avoiding participation in relevant screening behaviours for Cardiovascular Disease (CVD) such as cholesterol tests. A growing body of research in the area of Terror Management Theory (TMT) has begun to suggest that many of these sorts of risky health decisions are often strongly influenced by the presence of existential anxiety (e.g. Taubman - Ben-Ari, Florian & Mikulincer, 1999; Hirschberger, Florian, Mikulincer, Goldenberg & Pyszczynski, 2002; Miller & Taubman - Ben-Ari, 2004; Routledge, Arndt & Goldenberg, 2004; Taubman - Ben-Ari, 2004; Jessop, Albery, Rutter & Garrod, 2008; Arndt et al., 2009). In other words, this research has begun to demonstrate that the adoption of risky health behaviours may be determined more by an individual's attempts to avoid existential anxiety than by the physically protective capacity of the behaviours themselves.

Some recent TMT research in this area has found that unconscious existential anxiety can lead to avoidant responses towards cancer-screening. For instance, Arndt, Cook, Goldenberg & Cox (2007) demonstrated that thinking about contracting cancer can cause people to suppress thoughts concerning death and can lead them to exhibit greater psychological avoidance of cancer-screening behaviours. In a similar vein, Goldenberg, Arndt, Hart & Routledge (2008) found that mortality reminders reduced women's intentions to conduct breast self-exams to screen for cancer and Goldenberg, Routledge & Arndt (2009) found that mortality reminders made women exhibit greater patterns of avoidance towards mammograms. Following this research, the current research programme was established in order to investigate whether or not existential anxiety could interfere with people's intentions to use a novel Point-of-Care Testing (POCT) technological device that has been proposed by the Biomedical Diagnostics Institute (BDI) in Dublin City University (i.e. the "CVD Risk Biochip" system) for the measurement of CVD risk.

The CVD Risk Biochip is a miniature device designed to detect the concentration levels of a number of different proteins in the blood in order to deliver a fast but highly accurate indication of an individual's future risk for developing CVD. The chip itself contains several different "detection zones"; each of which contain antibodies with a fluorescent dye attached to them that specifically bind to a particular protein in the blood. Depending on the concentration of one of these proteins in the blood, an equivalent amount of fluorescent signal is emitted from the corresponding detection zone. When taken together, the detected concentration levels of these proteins can indicate a person's future risk for developing CVD. Some proposed advantages of this device include the removal of costs for transporting blood samples to an external laboratory for tests of CVD risk and the minimisation of the number of steps required to carry out a risk assessment of this kind. By introducing this new device, the BDI have also proposed to move CVD risk assessment from its current settings in the hospital and laboratory to GP's offices, ambulances and ultimately the home. However, there are several potential disadvantages in placing a device like the CVD Risk Biochip in a home setting over conventional clinical analyses, including its limitation to measuring only a few proteins in the blood and the fact that a physician would be able to better interpret the results by referring to the patient's medical history. Furthermore, since CVD is an illness where death is a very real consequence, thoughts relating to the development of the illness may create high levels of anxiety concerning death in the patient that may inhibit their uptake of such a device (e.g. Cameron & Leventhal, 1995; Aikens, Michael, Levin & Lowry, 1999; van Steenkiste, van der Wijden, Timmermans, Vaes, Stoffers & Grol, 2004). Indeed, as described above, an analogous effect has already been demonstrated in TMT literature relating to cancer screening (Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009).

Arising from these concerns, the current research programme was established in order to investigate whether or not existential anxiety could act as a barrier to the voluntary uptake of the CVD Risk Biochip in a GP's office or home setting. More specifically, it was reasoned that thoughts about using the CVD Risk Biochip could increase an individual's death-related cognitions due to the inherent associations between CVD and death, leading such individuals to avoid the uptake of this device and to exhibit less favourable attitudes towards it in order to sidestep the potential existential

anxiety associated with its use. The following chapter introduces these central research questions and the theoretical framework pertaining to the current research programme in greater detail and provides a literature review of research areas relevant to the programme.

The first two studies in the programme are then described in Chapters 3 and 4 respectively. In line with TMT, these first two studies examined whether or not getting participants to think about their death (Mortality Salience) or having a heart attack (Heart Attack Salience; a unique measure designed for these studies) and subsequently distracting them would lead to more avoidant responses towards the CVD Risk Biochip than participants who were asked to think about a death-neutral topic. These studies found that neither a cohort of participants aged over 55 years (Study 1) nor a cohort of participants aged 40-55 years (Study 2) displayed significant differences between the experimental and control conditions on dependent variables of attitudes and behavioural intentions towards the device and commitment towards its use.

In order to investigate the possibility that the potentially very threatening nature of thinking about a heart attack led participants in the Heart Attack Salience groups in the first two studies to suppress death-related thoughts to a greater extent than expected, a third study was conducted. More specifically, this third study, which is documented in Chapter 5, was designed to check if "death thought accessibility" (DTA) would be higher among participants who were given a Heart Attack Salience task when they were placed under conditions of increased cognitive load compared to participants who were given a distraction task following Heart Attack Salience and two analogous groups of participants who received a Control task. The results of this study revealed no significant differences between any of these groups of participants in the number of death-related word fragments completed by them on a standard DTA measure. The study also uncovered a potential set of limitations regarding the measurement of death-thought accessibility in the TMT literature. In particular, there was strong evidence of the confounding effects of word frequency and word ambiguity in the standard DTA measure used in the study.

Following the findings of the first three studies in the research programme, a fourth and final study was conducted, which is outlined in Chapter 6. This study contained an alternative measure of priming existential concerns to the measures used in the first three studies in the programme. Specifically, half of the participants in this study received a "Creatureliness Prime" adapted from other TMT research (e.g. Goldenberg et al., 2001) in place of the Mortality Salience or Heart Attack Salience condition, while the other half received a "Uniqueness Prime". The former measure consisted of getting participants to think about the creaturely aspects of being human; an existential prime which had resulted in significantly greater avoidant responses towards cancer-screening in prior TMT research (e.g. Goldenberg et al., 2008; Goldenberg et al., 2009). The latter measure involved asking participants to think about the uniqueness of humans as compared to other animals (i.e. the control group relating to this methodology). In line with prior TMT research, it was predicted that those participants who were given the Creatureliness Prime would demonstrate more avoidant responses towards the device than those who received the Uniqueness Prime. Additionally, this study investigated if there would be differences in participants' reactions towards the CVD Risk Biochip after they had self-esteem experimentally manipulated by having them reflect on an important personal failure or success (as per Routledge et al., 2010). Following prior TMT research, it was predicted that those participants who had their self-esteem experimentally lowered would demonstrate more avoidant responses towards the device than those participants who had their self-esteem experimentally boosted. Despite the above predictions, the results of the fourth and final study failed to demonstrate that there were any barriers to the use of the CVD Risk Biochip resulting from receipt of the Creatureliness Prime and a distraction or having one's self-esteem experimentally threatened.

As an alternative to these TMT effects, the final study also investigated the possibility that the CVD Risk Biochip promotes feelings of disembodiment or dissociation towards the risk information that it provides, thereby effectively resulting in a diminished response of existential anxiety towards the device. This idea was based on ideas from philosophy and sociology of technology literature that has suggested that technological devices like the CVD Risk Biochip that predict the future through abstractions (i.e. by using codes and quantified ratios) tend to appear intangible and

disembodied to the normal subject, leading to more ambivalent and "cool" responses towards them (e.g. Baudrillard, 1995; Prior, Wood, Gray, Pill & Hughes, 2002). Accordingly, this alternative hypothesis predicted that participants would demonstrate strong feelings of disembodiment or dissociation towards the risk information that the device provides regardless of their experimental condition. However, contrary to this hypothesis, participants suggested that they would easily be able to relate such risk information to their experiential knowledge of their own health.

The final chapter in this thesis (Chapter 7) explores the results of the four studies in the current research programme with respect to the broader context of TMT and health-related research in general and examines the implications of the results of the programme for TMT and the promotion of health threat detection behaviours.
In this regard, the combined results of the four studies in the research programme appear to suggest that existential concerns do not operate as a barrier towards devices like the CVD Risk Biochip. A central implication of these findings is that POCT devices like the CVD Risk Biochip may have improved uptake to other forms of health threat detection, potentially due to the fact that they furnish an individual with a risk status for developing a condition rather than indicating the presence or absence of a condition. In order to ensure such improved uptake, it may be particularly important to emphasize that such devices have the potential to be used by lay people to monitor their health status and to explicitly frame such POCT devices as providing an indication of "risk" for developing a condition. Additionally, such POCT devices provide individuals who are potentially at risk for developing CVD with the capacity to monitor their condition; thereby endowing them with a sense of autonomy in relation to their health. Furthermore, none of the central hypotheses derived from TMT research were supported by the results of the current research programme. A likely explanation for such a pattern of results is that TMT may not work in an Irish context; an idea that is supported by prior TMT studies involving Irish participants and qualitative research that has found that Irish people hold cultural representations of death that may protect them from existential anxiety. This may mean that TMT processes are not as cross-culturally reliable as TMT authors assume.

There are numerous contributions that the current research programme has made to the study of TMT. Firstly, the relationship of existential concerns to CVD and heart

attacks and the application of TMT to the uptake of POCT devices are issues that have not been previously been explored through a TMT framework. As a result, the current research programme extends TMT to these areas of study. Secondly, the content analyses of the Heart Attack Salience task in the first three studies highlighted the potential validity of this task as a method of priming death-related cognitions and illustrated that it has the capacity to elicit death-related thoughts to the same extent as Mortality Salience. Thirdly, by highlighting the potential for cultural representations of death that may protect individuals from existential anxiety, the current research programme also brings forward central questions of the cross-cultural reliability of TMT research. Some of the central implications of this finding are that TMT processes may not easily transfer to cultures where death is openly discussed and that the meaning and value-oriented contents of cultural worldviews should not be taken for granted in future TMT research. Instead, future TMT research should initially investigate such aspects of culture in a more qualitative fashion or with reference to anthropological evidence derived from a particular cultural context. Finally, some of the findings in the results of Study 3 appear to reflect the potential for word frequency and word ambiguity to have confounding effects on the measurement of DTA in TMT research. This uniquely highlights the need to control for such effects in the future measurement of this construct.

There are a couple of additional strengths of the current research programme that should be highlighted. Firstly, the current studies attempted to control for potential gender differences in the uptake of health threat detection devices and the possibility of gender-related differences in TMT-related processes. Although gender-related differences have been previously examined in TMT to a minor extent (e.g. Arndt, Greenberg & Cook, 2002; Hirschberger et al., 2002; Taubman Ben-Ari & Findler, 2003; Arndt et al., 2007), they have not been given a central platform in some of the more central developments of the theory (e.g. the dual-process model of TMT defences proposed by Pyszczynski, Greenberg & Solomon, 1999, or the Terror Management Health Model proposed by Goldenberg & Arndt, 2008). Through some moderate support for gender-related differences with respect to health threat detection behaviours, the current research programme calls attention to the potential necessity for gender-related concerns to be factored into future TMT research. Additionally, the current research programme examined TMT mechanisms in the context of POCT by

targeting middle-aged and older adult participants for its principal research questions rather than employing the typical convenience samples of psychology students used in most of the prior TMT research, thereby providing a potentially more ecologically valid context for the examination of existential concerns.

Chapter 2: Literature Review and General Introduction to the Current Research Programme

Before exploring the methodological framework of the current research programme in detail, it will be necessary to give an account of evidence from the domain of health psychology concerning the psychological minimisation of health threats and research that has uncovered patterns of defensive avoidance in relation to disease detection behaviours. In addition to providing such an account, the literature review which follows will introduce TMT and some of its most important constructs before describing the emerging developments in TMT relating to proximal and distal defences and the burgeoning Terror Management Health Model (TMHM). Following this, some of the most significant contributions that the theory has made to the understanding of risky health behaviours and, more recently, to the psychological avoidance of cancer-screening behaviours will be documented. Finally, this literature review will furnish the reader with some background information concerning POCT and the development of POCT devices for indicating CVD risk before the details of the CVD Risk Biochip system itself and the central ideas governing the current research programme are presented.

2.1 Health Threat Minimisation and Health Threat Detection Behaviours

A plethora of evidence from the health psychology literature suggests that people often minimise the importance and relevance of a health threat in order to deny their vulnerability to it (for a review of some of the most pertinent literature relating to this topic, see Ditto & Croyle, 2003). A key research program that has examined the psychological minimisation of health threats in this fashion is the so-called "Thioamine Acetylase (TAA) Enzyme Paradigm", which has its origins in the experimental work of Jemmott, Ditto & Croyle (1986). These researchers created a procedure which involved inviting participants into a laboratory in order to "test" them for the presence of a fictitious condition called "TAA Deficiency"; an alleged enzyme deficiency that the researchers led their participants to believe had been recently discovered and which supposedly constituted a "risk factor for mild but irritating pancreatic disorders". Following an explanation of the deficiency and a description of a simple diagnostic test for detecting it, participants were then asked to

either self-administer the test themselves or given the opportunity to have a health professional administer the test to them. Those participants who agreed to take the test were then either given feedback that suggested that they had the deficiency (positive feedback) or given feedback that suggested that they did not have the deficiency (negative feedback) and were subsequently administered a questionnaire about their judgements of the seriousness of the enzyme deficiency.

A body of research has been conducted using comparable procedures to those described above. The questionnaires that are typically administered to participants following their receipt of the information about the enzyme deficiency and their own risk information tend to assess their judgements about the seriousness of the enzyme deficiency, the validity of the diagnostic test that was performed or similar questions relating to these participants' perceptions about the importance or relevance of the health threat to their own health. Through this experimental paradigm, research has suggested that those participants who receive positive feedback tend to rate the deficiency as significantly less serious than those who receive negative feedback (e.g. Jemmott et al., 1986), that those participants who receive positive feedback tend to perceptually distort the feedback presented to them about the deficiency compared to those who receive negative feedback (e.g. Ditto, Jemmott & Darley, 1988) and that participants who are given positive feedback tend to provide higher estimates of the prevalence of the deficiency in the general population compared to those who receive negative feedback (e.g. Croyle & Sande, 1988). Additionally, Ditto & Lopez (1992) found that those participants who were given feedback suggesting that they were deficient in the fictitious "TAA enzyme" tended to rate the test results as less accurate when they were led to believe that the deficiency represented a health threat compared to a different group of participants who were led to believe that the enzyme deficiency represented a beneficial or benign condition.

Many of the above findings with the "TAA Enzyme Paradigm" have also been replicated with analogous experiments that have involved participants' appraisals of risk factor estimates in real-life screening situations. A consistent finding in this literature is that individuals who are told that they possess risk factors for a well-known health threat tend to downplay the seriousness of the risk relative to those individuals who are told that they do not have the risk factor (e.g. Eiser, Sutton &

Wober, 1979; Ditto et al., 1988; Croyle, 1990; Croyle, Sun & Louie, 1993; Croyle, Sun & Hart, 1997). For example, Croyle (1990) discovered that those participants who were informed that their blood pressure was above average tended to rate high blood pressure as a less serious health threat than those participants who were told that their blood pressure was normal. Similarly, Croyle and colleagues (1993) found that participants who were told that their cholesterol level was at an undesirably high level were significantly more likely to consider high cholesterol levels to be a less serious threat than participants who were told that their cholesterol level was at a more desirable level.

In addition to such patterns of health threat minimisation, another strategy that people appear to adopt in order to cope with a serious health threat is "defensive avoidance" (i.e. when one avoids becoming fully informed about a health threat as a way of circumventing the potential for receiving disconcerting information; Thompson, Robbins, Payne & Castillo, 2011). Despite the fact that this sort of avoidant thinking may be particularly dangerous when the health threat in question is a dangerous disease or serious health condition, there is much evidence to suggest that people often display such patterns of avoidance when they perceive that a particular health-relevant behaviour could threaten their health status, irrespective of whether or not such behaviours serve a health-protective function (e.g. Jemmott et al., 1986; Cameron, 1997; Luce & Kahn, 1999; Kahn & Luce, 2003; Brett, Bankhead, Henderson, Watson & Austoker, 2005). For instance, in a meta-analysis of the persuasive impact of fear appeals in relation to health threats, de Hoog, Stroebe & de Wit (2007) found that priming a participant's vulnerability to a severe health threat tends to consistently trigger a response among such participants of minimising the relevance or importance of the health threat. In this regard, Millar & Millar (1993, 1995) have distinguished between health threat detection and health-promotion behaviours in their capacity to threaten an individual's health status. They argue that health threat detection behaviours (e.g. screening for cholesterol) potentially pose a threat to a person's perceptions of good health leading to negative and avoidant responses towards these behaviours, whereas health-promotion behaviours (e.g. reducing the fat in one's diet) provide a positive route to improving a person's health and well-being. For example, Millar (2006) found that participants who were characterised by a repressive personality (using the method of classifying repressors

established by Weinberger,1990) tended to spend less time reading health threat detection behaviour messages and recalled fewer of them than health-promotion behaviour messages. Such participants also displayed weaker intentions to perform health threat detection behaviours compared to health-promotion behaviours. In a related vein, Arndt et al. (2007) have argued that avoidant responses towards health threat detection behaviours are likely to result from the paradox that arises between knowledge of a health threat and fear of that knowledge. Finally, Cameron (1997) has also pointed out that health threat detection behaviours such as screening are qualitatively different to other types of health-protective behaviours in the sense that they do not directly reduce the risk for the onset of the particular health threat of interest.

These patterns of minimisation and avoidance have been increasingly demonstrated in the health psychology literature with respect to diseases of the heart. In a series of early studies on this research topic, Horowitz and colleagues (Horowitz et al., 1980; Horowitz et al., 1983) found that the stress of discovering that one is at high risk for developing heart disease can lead to continual and persistent denial of this information. Avis, Smith & McKinlay (1989) also found in their large-scale study of 732 men and women between 25-65 years of age from Massachusetts that a high percentage of their participants who were identified as being at risk for developing coronary heart disease consistently rated their risk of having a heart attack within the following 10 years as less than that of their peers. A growing body of evidence since these early research studies has demonstrated that many people tend to minimise the importance and relevance of CVDs and their related symptoms to their own health (e.g. Croyle et al., 1993; Mengden et al., 1998; Ketterer et al., 1998; Newell Girgis, Sanson-Fisher & Savolainen, 1999; Emslie, Hunt & Watt, 2001; O'Carroll, Smith, Grubb, Fox & Masterton, 2001; Ketterer et al., 2004; Van Steenkiste et al., 2004; Caldwell, Arthur, Natarajan, & Anand, 2007; Huerta, Tormo, Egea-Caparrós, Ortolá-Devesa & Navarro, 2009). For instance, Van Steenkiste and colleagues (2004) demonstrated qualitatively that people tend to minimise their likelihood of developing CVD and that preventive steps towards CVD are often impeded by fears of developing the illness.

Some of the research on the minimisation and avoidance of CVD and its related symptoms has explicitly focused on the causal determinants of such patterns of avoidance, such as individuals' feelings of perceived vulnerability and loss of control in the face of CVD-related stimuli. In this regard, Cameron & Leventhal (1995) found that people who possess stable beliefs about their vulnerability to CVD tend to avoid fear-provoking stimuli relating to CVD that could remind them of this perceived vulnerability. Emslie et al. (2001) have also shown that the avoidance of CVD-related stimuli may be related to persistent views that CVDs are very sudden and potentially fatal and, consequently, that many patients feel that it is better "not to know" if one has a heart-related disease or not. Elsewhere, O'Carroll and colleagues (2001) found that patterns of defensive avoidance following a myocardial infarction are often the result of an individual's beliefs that health outcomes are largely unmodifiable and due to chance factors. Similarly, Caldwell and colleagues (2007) found that both men and women's avoidant behaviours relating to a diagnostic cardiac measure were rooted in fears of a loss of personal control, potential future medical complications and an uncertain future where their agency may be substantially impaired.

There are a number of consequences of such patterns of denial and self-exemption with respect to CVD and its associated risk factors. For instance, the self-exemption of CVD and its related symptoms to their own health can lead people to continually engage in behaviours that are known to lead to the development of CVD, such as smoking (e.g. Peretti-Watel, Halfen & Grémy, 2007). Additionally, emerging research has demonstrated that health threat minimisation can lead people to deny or forget the presence of previously diagnosed risk factors for CVD such as high cholesterol and hypertension (e.g. Irvine & Logan, 1994; Croyle et al., 2006). Such patterns of denial may even persist for males after they have experienced a myocardial infarction or have been diagnosed with coronary artery disease (e.g. Ketterer et al., 1998; Ketterer et al., 2004). These patterns of denial and avoidance in relation to CVD are particularly relevant to some of the emerging research and theory from within the TMT paradigm that has examined how people's receipt of mortality reminders can lead to their subsequent adoption of risky health behaviours or their defensive avoidance of health threat detection behaviours such as cancer screening.

2.2 Terror Management Theory (TMT)

TMT has emerged in the last 20 years as a leading social psychological theory of human motivation with the capacity to explain much behaviour that is unique to humans. Current research in TMT has replicated some of the above findings from health threat minimisation and disease detection research, while providing a framework that potentially explains the motivations behind why people behave in these ways when their health is threatened. The theory itself is based on the writings of a cultural anthropologist named Ernest Becker (e.g. 1973, 1975), who was interested in the internal motivations behind behaviours that are unique to humans. In particular, Becker was interested in questions like "Why do humans value symbolic thought?", "Why is self-esteem so important to people?" and "Why do people from different cultures come into serious conflict with each other over their beliefs?"

In order to get answers to these sorts of questions, Becker felt it was important to first identify the kinds of traits and attributes that are specific to humans. Like Otto Rank and Søren Kierkegaard before him, he noted that one of the things that make us distinctly different from other animals is our specially equipped intelligence, which has granted us with the ability to conceptualise reality in terms of cause-and-effect relationships, the capacity to think hypothetically about the future and the cognitive faculties necessary for self reflection (Becker, 1973). Although these cognitive capabilities have many advantages to us (e.g. the design of many devices that are based on exploiting the cause-and-effect processes of electricity and the ability to make provisions for the future), a potential disadvantage that they bring with them is a growing awareness of our mortal and transient existence. According to Becker, this awareness of our mortality has the potential to create feelings of paralysing terror (often termed existential anxiety), when taken together with our biologically-wired Darwinian self-preservation instinct. In order to alleviate this terror, Becker (1973, 1975) argued that we have created culture; a system of values that allows us to feel as if we are meaningful contributors to something greater than our own animal existence. He also proposed that culture provides, to some extent, a sense of symbolic immortality that allows us to temporarily "deny death" by enabling us to associate ourselves with a system of valued ideas and practices that will outlive us. In addition to providing the possibility of symbolic immortality, culture may even provide us

with the possibility of a more literal sort of immortality (e.g. in the case of religion) by means of an afterlife.

In line with Becker's writings, the original proponents of TMT (Greenberg, Pyszczynski & Solomon, 1986) posited that humans have evolved a "Cultural Anxiety Buffer" (CAB) in order to defend against existential anxiety. The CAB is a system of defence against existential anxiety that allows people to perceive themselves as valuable contributors to a meaningful universe and includes two central components; cultural worldviews and self-esteem. According to TMT authors, the construction and maintenance of cultural worldviews (i.e. systems of belief rooted within a particular cultural tradition) allow humans to inject meaning and permanence into their lives by creating transcendent standards of value and providing them with a sense of belonging to structures that have the potential to endure and outlive themselves and their offspring (Solomon, Greenberg & Pyszczynski, 1991). Self-esteem, on the other hand, is an individual's own sense that they are living up to the standards of value provided by culture. People gain this sense that they are upholding cultural values through the consensual validation of their peers towards their behaviours (Solomon et al., 1991). In light of this proposal that the central structures of the CAB provide people with an avenue of defence against existential anxiety, TMT has predicted that a substantial amount of human social behaviour is concerned with the maintenance and defence of cultural worldviews and self-esteem. In order to test their more specific ideas about people's reactions towards death, TMT researchers have put forward three central hypotheses; the *Mortality Salience Hypothesis,* the *Anxiety-Buffer Hypothesis* and the *Death-Thought Accessibility Hypothesis.*

The *Mortality Salience Hypothesis* suggests that explicitly reminding people of their own mortality will lead to increases in their need for faith in cultural worldviews as a means to protect them from existential anxiety. Evidence in support of this proposition has been demonstrated in a number of studies which have shown that those participants who were reminded of their mortality responded more favourably to others who could be seen to uphold their own cultural values (e.g. Greenberg et al., 1990) and more negatively to others who could be seen to have violated cultural standards of justice (e.g. Rosenblatt, Greenberg, Solomon, Pyszczynski & Lyon,

1989; Greenberg et al., 1995; Florian & Mikulincer, 1997). TMT studies have also shown evidence for this hypothesis by demonstrating that mortality reminders can lead people to engage in a range of culturally defensive behaviours such as displaying greater in-group preferences and out-group biases (e.g. Greenberg et al., 1990), displaying increases in nationalism (e.g. Dechesne, Janssen, & van Knippenberg, 2000; Pyszczynski, Solomon & Greenberg, 2003), upholding their own political ideals more staunchly (e.g. Greenberg, Simon, Pyszczynski, Solomon & Chatel, 1992), upholding the values of the cultural worldview that is most available to them at a particular time (e.g. Walsh & Smith, 2007), derogating those who threaten their cultural worldview and supporting those who champion their cultural worldview (e.g. Greenberg, Pyszczynski, Solomon, Simon & Breus, 1994; Harmon-Jones et al., 1997; Arndt et al., 1997b; Greenberg, Arndt, Simon, Pyszczynski & Solomon, 2000). Furthermore, affirming an important cultural value has been found to reduce worldview defences and the accessibility of death-related thoughts following mortality reminders (e.g. Schmeichel & Martens, 2005), providing further support for the idea that cultural values are important structures that are used by people to reduce their existential anxieties. Additional evidence in support of this hypothesis has demonstrated that thoughts concerning symbolic immortality can serve to reduce existential concerns (e.g. Florian & Mikulincer, 1998), that focusing on creaturely aspects of being human leads to greater disgust at the human body and an increase in cultural worldview defences (e.g. Goldenberg et al., 2001; Goldenberg, Cox, Pyszczynski, Greenberg & Solomon, 2002; Goldenberg et al., 2008) and that existential anxiety itself tends to increase a need to distinguish humans from other animals (e.g. Goldenberg et al., 2001).

Some studies on the "natural TMT experiment" that constituted the terrorist attacks of 11th September 2001 have also added support to the Mortality Salience Hypothesis. For instance, TMT researchers have found that the terror resulting from the attacks themselves and their aftermath had the effect of increasing American citizens' performance of altruistic and pro-social behaviour (Kumagai & Ohbuchi, 2002), escalating their search for meaning and value in life (Pyszczynski et al., 2003), heightening their support for American foreign policy (Landau et al., 2004b) and intensifying their commitment to exploring their own identity (Dunkel, 2002). Young-Ok & Schenck-Hamlin (2005) also found that there was a widespread increase

in the number of racist comments made about Arab Muslims among American-born citizens following these terrorist attacks.

The second major TMT hypothesis, the *Anxiety-Buffer Hypothesis*, proposes that, if a psychological structure serves as a buffer for existential anxiety, then providing measures to strengthen that structure should decrease an individual's existential anxiety and providing measures to weaken that structure should increase their existential anxiety. This hypothesis has been supported through many studies that have examined the anxiety-buffering effects of self-esteem, which have found that participants who had their self-esteem experimentally increased through positive feedback reported less anxiety towards mortality reminders than controls who received neutral feedback (Greenberg et al., 1992b; Schmeichel et al., 2009), that participants with dispositionally high self-esteem exhibited less defensive reactions to a health threat like denying one's vulnerability and mortality (Greenberg et al., 1993; Schmeichel et al., 2009) and that high levels of self-esteem reduced the cultural worldview defence effects that occur as a result of receiving mortality reminders (e.g. Harmon-Jones et al., 1997). Some studies that have investigated this hypothesis have also shown that reminding people of their mortality can lead to increases in defensive self-esteem strategies that serve to maintain or enhance an individual's sense of self-worth when faced with the terror of death (e.g. Mikulincer & Florian, 2002) and that subtle mortality reminders can increase an individual's perception that there is social consensus for their beliefs (e.g. Osborn, Johnson & Fisher, 2006). Additional evidence supporting this hypothesis has shown that the following alternatives to self-esteem can also provide buffering effects to existential anxiety; high levels of health optimism (e.g. Arndt, Routledge & Goldenberg, 2006), high levels of self-efficacy with regard to specific behaviours (e.g. Miller & Taubman - Ben-Ari, 2004) and secure attachment rather than insecure attachment (e.g. Mikulincer & Florian, 2000; Taubman-Ben-Ari, Findler & Mikulincer, 2002).

A third major hypothesis derived from TMT, the *Death-Thought Accessibility Hypothesis*, has been investigated in several different contexts over the last fifteen years or so but was first explicitly formalised by Schimel, Hayes, Williams & Jahrig (2007). Schimel et al. (2007) have suggested that this hypothesis is a direct corollary of both the *Mortality Salience Hypothesis* and the *Anxiety-Buffer Hypothesis*; i.e. that

if a structure such as the CAB provides a buffer against the awareness of mortality, it follows that threatening this structure should increase an individual's awareness of mortality. One line of research that has supported this hypothesis has involved an examination of threats to the perceived stability of romantic relationships (since being in a romantic relationship could be seen to provide a buffer against existential anxiety). In this regard, Florian, Mikulincer & Hirschberger (2002) found that, when participants in their study were asked to think about problems in their romantic relationships, they tended to become more aware of death-related concepts. Similarly, Mikulincer, Florian, Birnbaum & Malishkevich (2002) found that thinking about separations from a romantic partner (either following death or a relationship breakdown) led participants to become more aware of their own mortality. In a related vein, Bassett (2005) found that threatening the valued cultural worldview component of marriage among students from Louisiana led to increases in their levels of implicit death-related denial. This dimension was measured on a task that involved pairing death-related words (death, die, dying) to self-words (me, my, mine) in comparison to pairing the same death-related words to other words (they, them, theirs). Those participants who read an essay that derogated the idea of the sanctity of marriage took a longer amount of time to pair self-words to the death-related words than they took to pair the other words to the death-related words.

More recent research involving the *Death-Thought Accessibility Hypothesis* has focused more specifically on the inverse aspects of the *Mortality Salience Hypothesis* and the *Anxiety-Buffer Hypothesis* that the hypothesis suggests. For instance, Schimel et al. (2007) explored whether or not threatening valued components of worldviews would lead to increases in the awareness of death (the inverse of the *Mortality Salience Hypothesis*). Across four studies, these researchers found that Canadians who read an essay that derogated a valued component of their national identity (i.e. the Canadian system of receiving free healthcare from the government) tended to experience a greater accessibility of death-related concepts than Canadians who read an equivalent essay that derogated a valued component of Australians' national identity. Additionally, they found that participants who aligned themselves with a creationist worldview displayed higher increases in their availability of death-related concepts after reading an essay that disparaged the creationist worldview in comparison to creationist participants who read a neutral essay and participants who

aligned themselves with an evolutionist worldview who read the essay that disparaged creationism. Hayes, Schimel, Faucher & Williams (2008) also explored whether or not threatening self-esteem would lead to increases in death awareness (the inverse of the *Anxiety-Buffer Hypothesis*). They found that threatening participants' self-esteem in the following three ways led to increases in the accessibility of death-related concepts; i) presenting participants with negative feedback about their intelligence, ii) suggesting to participants that their personalities did not fit the profile for them to successfully pursue their chosen career path and iii) informing participants that they would have to give a speech for which they had not prepared. Routledge et al. (2010) replicated Hayes et al.'s (2008) results through their findings that participants who were asked to think about a time when they failed to live up to an important value exhibited increases in their awareness of their own mortality in comparison to participants who were asked to think about a time when they succeeded in living up to an important value.

Using the above hypotheses as a conceptual framework, TMT has been supported by more than 300 studies conducted in over a dozen countries, ranging in focus in the examination of behaviours as diverse as conspicuous consumption (e.g. Solomon, Greenberg & Pyszczynski, 2004, Arndt, Solomon, Kasser & Sheldon, 2004), relationship attachment (e.g. Hart, Shaver & Goldenberg, 2005) and risky driving (e.g. Taubman - Ben-Ari et al., 1999; Taubman -Ben-Ari et al., 2000). A recent large-scale meta-analysis of the Mortality Salience Hypothesis in the TMT literature involving 277 studies has demonstrated that thinking about death consistently produces moderate to large effects on attitudinal and behavioural dependent variables, with no moderation of Mortality Salience effects by sample size (Burke, Martens & Faucher, 2010). This meta-analysis included an extensive search for unpublished TMT studies and revealed no evidence of publication bias towards studies with moderately or highly significant results after revealing a fail-safe *N* of 4,239 (i.e. the number of unpublished or future studies averaging null results that would be necessary to reduce the overall effect size for the meta-analysis was more than 15 times the number of studies examined in the analysis itself).

Despite the consistent support for the central hypotheses arising from the theory, many critics of TMT have focused on its potential incompatibility with current

evolutionary theories. For instance, Leary & Schreindorfer (1997) and Buss (1997) argued that TMT authors have not made a strong case that terror management processes increase an organism's chances of survival and reproduction. These authors suggest that, according to evolutionary theories, anxiety evolved as a way of promoting survival (e.g. through "fight or flight" mechanisms). Thus, reducing anxiety in the manner suggested by TMT authors should function to reduce survival chances. In a similar fashion, it could be argued that TMT conflicts with direct causation theories of emotion (e.g. Rozin, 1976; Keltner & Gross, 1999) that suggest that the central function of emotion is to directly cause particular behaviours (e.g. disgust makes one avoid unsafe foods, anger makes one fight, sadness makes one seek sympathy, etc.). However, Solomon, Greenberg & Pysczynski (1997) have pointed out that existential anxiety is not specifically linked with promoting survival, nor is it always directed towards specific behaviours. Instead, existential anxiety can be seen as an unfortunate by-product of the human capacity for hypothetical thought. This is because existential anxiety is a pre-contemplative form of anxiety that occurs towards mortality reminders, does not always involve behaviours directly and often involves an abstract conception of death. Indeed, TMT research has consistently demonstrated that people often try to distract themselves from existential anxiety by adopting rationalising defences rather than directly adopting certain behaviours (e.g. Greenberg et al., 1990; Silvia, 2001; Pyszczynski et al., 2003; Walsh & Smith, 2007). In contrast, other forms of anxiety which promote an organism's survival chances tend to be more directly related to life-threatening situations and tend to result in the performance of specific behaviours. Importantly then, existential anxiety does not have to occur in response to an imminent threat as an individual may reflect on her mortality and subsequently experience existential anxiety at a time when there is no immediate danger present. In this fashion, Solomon et al. (1997) argue that removing existential anxiety would not necessarily decrease an organism's chances of survival as the anxiety itself is not inherently linked to a specific life-threatening situation. Similarly, TMT has shown that existential anxiety does not necessarily result in the performance of particular behaviours but may involve a distraction from the emotion itself through processes of rationalisation.

Proponents of TMT have also suggested that their findings that people often engage in behaviours that are detrimental to their health and well-being cannot be easily

explained by evolutionary theory or direct causation theories of emotion. For instance, neither theory can readily account for the defensive avoidance of disease detection behaviours that TMT authors have uncovered (e.g. Greenberg et al., 2000; Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) as such behaviours often pose specific life-threatening consequences for individuals. In contrast, TMT has begun to account for such behaviours as an attempt on the individual's part to distract themselves from the potential existential reminder of engaging in disease detection behaviours. Additionally, Terror Management defences can be regarded as adaptive and functional in several ways. For instance, Solomon et al. (1997) propose that the Cultural-Anxiety Buffer is adaptive in its ability to remove anxiety, thereby allowing for humans to pursue other activities unabated by existential anxiety. Although it can be argued that this is merely an indirect form of adaptation, the removal of existential anxiety through the maintenance of self-esteem and cultural worldviews has very real advantages like preventing humans from wallowing in despair so that they can participate in goal-directed behaviours like finding a mate.

Another criticism of TMT relates to its central contention that the main purpose for self-esteem is to act as an anxiety buffer by providing an individual with a sense that they are living up to cultural standards of value. Leary (2004) argued that this idea implies that self-esteem must have evolved after culture; an idea which is very difficult to test experimentally. He suggests that, although one could argue that the belief systems and practices of a culture have developed to attenuate the unpleasantness of existential anxiety, self-esteem may have emerged as an anxiety buffer merely as a by-product of social-acceptance striving. Ryan & Deci (2004) also criticised TMT researchers' conceptions of self-esteem by suggesting that they only amount to a *contingent self-esteem,* which is based on fear and anxiety, rather than considering the possibility that self-esteem could arise out of the more positive process of an individual's motivations towards self-improvement and meaning-making (what they call *true self-esteem*). In response to these criticisms, Pyszczynski, Greenberg, Solomon, Arndt & Schimel (2004) have argued that *contingent self-esteem* must be satisfied before anything like *true self esteem* could be sought by an individual and that self-esteem and culture evolved simultaneously in humans in a

gradual process, involving increasingly complex representations of symbolic meaning as death became more salient to them due to their evolving cognitive capabilities.

Another common criticism of TMT is that the theory itself cannot account for forms of human motivation that are distinct from self-preservation. For example, Muraven & Baumeister (1997) and Buss (1997) have pointed out other types of motivations, such as sexual motivations, experiencing pleasure, avoiding pain and exploring or developing one's sense of self, cannot be subsumed under the basic motive of self-preservation. Although it is clear that other such motives exist in the human experience, Solomon et al. (1997) argue that the self-preservation motive must be satisfied before any additional motives can be sought. Additionally, it is important to point out that TMT does not attempt to account for every type of human motivation, instead focusing on the uniquely human problem of existential anxiety. Furthermore, while many existing theories of motivation focus on "how" particular social behaviours occur, most of these do not even attempt to explain "why" they occur. In contrast, TMT attempts to explain why people think and respond in particular ways towards existential anxiety and therefore the theory can be seen to have applied value with respect to its prediction of human behaviour.

Aside from these criticisms of the scope of TMT, there are a number of potential challenges for TMT research that have been identified. For instance, research by Wisman & Koole (2003) has indicated that mortality reminders can lead to increased affiliations between groups of people, even between groups of people with opposing worldviews. As a result, they suggest that TMT authors need to account for this additional type of defence, which they argue cannot be simply accounted for through the types of defences that are proposed by the theory in its current form. The majority of TMT research has also been conducted in Western cultures. Since TMT hypothesises that there are unique cultural defences against death following the work of Ernest Becker, the explanatory power of TMT processes may be limited to those cultural groups that have been studied thus far by TMT researchers. Additionally, according to Paulhus & Trapnell (1997), there may be differences between Western individualist cultures and Eastern collectivist cultures in their responses to existential anxiety as collectivist cultures tend to be more concerned with maintaining the current social structure than individualist ones. As a result, TMT defences may be

more pronounced in collectivist cultures; an area of interest that warrants future investigation. Although a growing body of TMT research has been conducted in non-Western countries over the last fifteen years, including a number of research studies conducted in Iran, Israel and China, more TMT research needs to be conducted in a variety of cultural settings in order to establish its external validity. A further challenge to TMT research is to extend its findings beyond convenience samples of psychology students. Although there have been several studies that have examined the effects of existential anxiety across different periods of a person's lifespan (e.g. Cicirelli, 2002; Taubman - Ben-Ari & Findler, 2005; Maxfield et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009), these studies are in the minority within the broad TMT literature.

Despite these potential limitations, TMT researchers have clearly demonstrated that existential anxiety produces behavioural and cognitive defensive responses that are specific to death-related anxiety (e.g. Greenberg et al., 1994; Arndt et al., 1997b) and not related to some other effect of experiencing anxiety toward an aversive event like making values or worrisome future concerns salient (Greenberg et al., 1995). In order to test the theory itself, these researchers have also come up with various unique ways of operationalising their ideas. Typically, their experiments prime participants to think about their own mortality or an alternative aversive control stimulus like dental pain with two standard open-ended questions; an experimental manipulation more commonly referred to as *Mortality Salience*. There have also been a number of alternatives to the Mortality Salience manipulation, the most common of which is a method which primes participants to think about the similarities between humans and other animals or the differences between humans and other animals (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Goldenberg et al., 2008). This manipulation has been found to work similarly to the Mortality Salience manipulation in TMT studies that have focused on the body as a source of self-esteem. In these studies, participants tend to favour emphasising the distinctness of humans from other animals when they are reminded of their own mortality (e.g. Goldenberg et al., 2001). Also, when human similarity to other animals is emphasised, people have been found to become less interested in the physical aspects of sexual relations but not the romantic aspects of such behaviours (e.g. Goldenberg et al., 2002). Detailed explanations for why this occurs are given by both Goldenberg (2005) and Becker (1973); both of whom have

underlined how creaturely (i.e. explicitly mortal) aspects of the human body are problematic for humans as they serve as reminders of their physicality, similarity to other animals and vulnerability to death and decay. From this perspective, people tend to want to cover up the more animalistic parts of the body like the genitals, tend to conceal unflattering bodily processes such as flatulence and excretion from others and even attempt to divert themselves from bodily aches, pains and bleeding in order to avoid the fact that these aspects of the body could potentially form a representative picture that suggests to them that they are no more than slowly rotting pieces of meat. Additionally, from this perspective, humans tend to value culture for its potential to distinguish them from other animals that do not appear to possess similar systems of meaning and transcendence.

2.3 Proximal and Distal Defences in TMT

A more recent trend in TMT literature has been to look at the role that the awareness of death plays in everyday human behaviour. Specifically, this research has examined whether or not there are differences in people's behavioural responses when death-related thoughts are conscious or when they are outside immediate focal awareness. In this regard, TMT researchers have proposed two distinctly different defensive mechanisms that people use to protect themselves from existential anxiety. These separate defensive mechanisms relate to death thoughts that are conscious or death thoughts that are just below conscious awareness, which have been termed *proximal defences* and *distal defences* respectively.

Proximal defences are conscious defensive strategies that constitute an individual's attempts to remove mortality reminders from their immediate conscious awareness (Pyszczynski et al., 1999). Since conscious attention initiates the logical processing of information, TMT authors argue that mortality reminders must be defended at more or less the same level of abstraction when such reminders are made conscious to an individual (Pyszczynski et al., 1999). Consequently, proximal defences often constitute rationalising threat-focused methods that serve to remove death-related thoughts from one's focal attention. These sorts of rationalising methods often comprise cognitive distortions that serve to deny one's vulnerability to mortality reminders or health-promoting promises that contiguously deal with mortality concerns by sublimating them (Pyszczynski, Greenberg & Solomon, 2000). By using

such proximal defensive strategies, individuals can directly counter anxiety concerning death by pushing the problem into the distant future, thereby temporarily abating the terror that can be derived from existential anxiety. In support of the existence of proximal defences, TMT studies have found that conscious awareness of one's mortality does not lead to symbolically defensive responses such as the defence and maintenance of cultural worldviews and self-esteem (Greenberg et al., 1994; Arndt et al., 1997a; Arndt et al., 1997b; Goldenberg & Arndt, 2008). Instead, such awareness has been found to lead to a greater suppression of death thoughts (e.g. Greenberg et al., 1994; Arndt et al., 1997b), exaggeration of one's health and hardiness (e.g. Greenberg et al., 2000) or rationalising commitments to health behaviours such as undertaking to go on a diet or get more exercise (e.g. Arndt, Schimel & Goldenberg, 2003). This evidence for proximal defences also provides a rebuttal to the common criticism of TMT that people rarely experience conscious thoughts about death that have profound effects on them (e.g. Muraven & Baumeister, 1997); proximal defences tend to remove the immediate threat of mortality reminders from focal attention by pushing them towards the fringes of consciousness.

However, since the proposed function of proximal defences is to simply avoid existential anxiety, TMT authors argue that they are not sufficient in assisting people to face up to the inevitability of death. Consequently, they have proposed that people need a different set of defences that they refer to as "distal defences" to prevent mortality reminders from re-entering conscious awareness (Greenberg et al., 2000). In addition to preventing further conscious awareness of mortality reminders, distal defences also prevent more subtle mortality reminders from entering a person's conscious awareness (Pyszczynski et al., 2000). Distal defences typically operate by utilising the CAB; i.e. the use of distal defences entails an individual's attempts to invest in cultural worldviews and the maintenance of self-esteem. Through the use of the CAB in this way, distal defences tend to prevent mortality reminders from re-entering consciousness by allowing people to perceive themselves as valuable contributors to a meaningful universe (Pyszczynski et al., 2000). Research in support of this type of defence has demonstrated that relatively subtle mortality reminders can produce more vigorous worldview defence than explicit mortality reminders (Greenberg et al., 1994), that subliminal presentation of death-related words leads to

greater worldview defence compared to supraliminal presentation of the same words (Arndt et al., 1997a), that accessibility of death-related thoughts is higher after a delay or distraction occurs (Greenberg et al., 1994; Harmon-Jones et al., 1997; Arndt et al., 1997b) and that impaired cognitive processing resources tends to lead to increased death-thought accessibility and cultural worldview defence immediately after mortality is made salient (Arndt et al., 1997b). Accordingly, distal defences may be activated either following a proximal defensive response to an explicit mortality reminder, when an individual encounters a mortality prime under conditions of high cognitive load, when mortality primes are presented in a subliminal fashion or when a delay or distraction occurs after a conscious mortality prime.

An important clarification was made by Greenberg, Arndt, Schimel, Pyszczynski & Solomon (2001) to the mechanism behind distal defences. These authors were interested in whether the opportunity to defend one's worldview when in a distal mode of defence leads to a dissipation of the awareness of one's mortality or to an active suppression of mortality-related thoughts. They demonstrated that the former explanation for distal defences appeared to be more appropriate through their finding that furnishing American participants with conditions of high cognitive load did not lead to increases in their accessibility of death-related concepts after they had received a Mortality Salience task and the opportunity to defend their cultural worldview (in this case, they were given the chance to give their reactions towards an anti-American essay). In other words, these participants, who were unable to suppress death-related thoughts in a proximal fashion due to their high cognitive load, exhibited lower levels of mortality awareness following reminders of mortality and a cultural worldview defence; presumably because the opportunity to defend their cultural worldview led to a dissipation of the impact of mortality reminders. In other words, this distal defence helped participants to "deny death" by undercutting the potential for mortality reminders to re-enter their conscious awareness. This finding was subsequently replicated in Study 2 of Schimel et al.'s (2007) research programme where they found that Canadian participants who defended a valued component of their cultural worldview did not display any increase in their accessibility of death-related concepts compared to Canadian participants who were not given the opportunity to defend a valued component of their cultural worldview.

Following this establishment of proximal and distal defence processes within Mortality Salience, TMT research has begun to establish that there is evidence for a temporal sequence involving these defences (e.g. Greenberg et al., 2000; Arndt, Greenberg & Cook, 2002). More specifically, this research has demonstrated that, following an explicit mortality reminder, an individual will engage in proximal defence strategies in order to attempt to remove them from their conscious awareness and will then proceed to engage in distal defences as a way of keeping these mortality reminders from re-entering their consciousness. Figure 2.1 provides an illustration of the particulars of this potential temporal sequence (adapted from Arndt et al., 2002). As illustrated in this diagram, upon presentation of explicit mortality reminders, an individual will initially engage in proximal defence strategies in order to suppress death-related thoughts. Once such thoughts have been removed from conscious awareness and there is a delay, mortality reminders have the potential to re-emerge into conscious awareness (i.e. these thoughts become highly accessible to the individual). Similarly, if an individual receives subliminal death-related information or receives a mortality reminder when under conditions of increased cognitive load, there is the possibility that thoughts concerning death might emerge into the individual's conscious focus. Following this possibility that mortality reminders may re-emerge into consciousness, a worldview-related defence or similar strategy to circumvent these reminders will become available to the individual. As depicted in the diagram, the availability of these strategies will depend on situational influences (e.g. if a self-esteem relevant behavioural strategy or a personal worldview defence strategy is primed by the situational context) and individual differences in the importance of certain constructs (e.g. defending American culture might be a relevant construct for Americans but not for Canadians). Correspondingly, whatever strategy becomes most readily available to the individual as a result of these situational influences and individual differences will be the one adopted by the individual as a distal defence with the express purpose of distracting themselves from their own mortality.

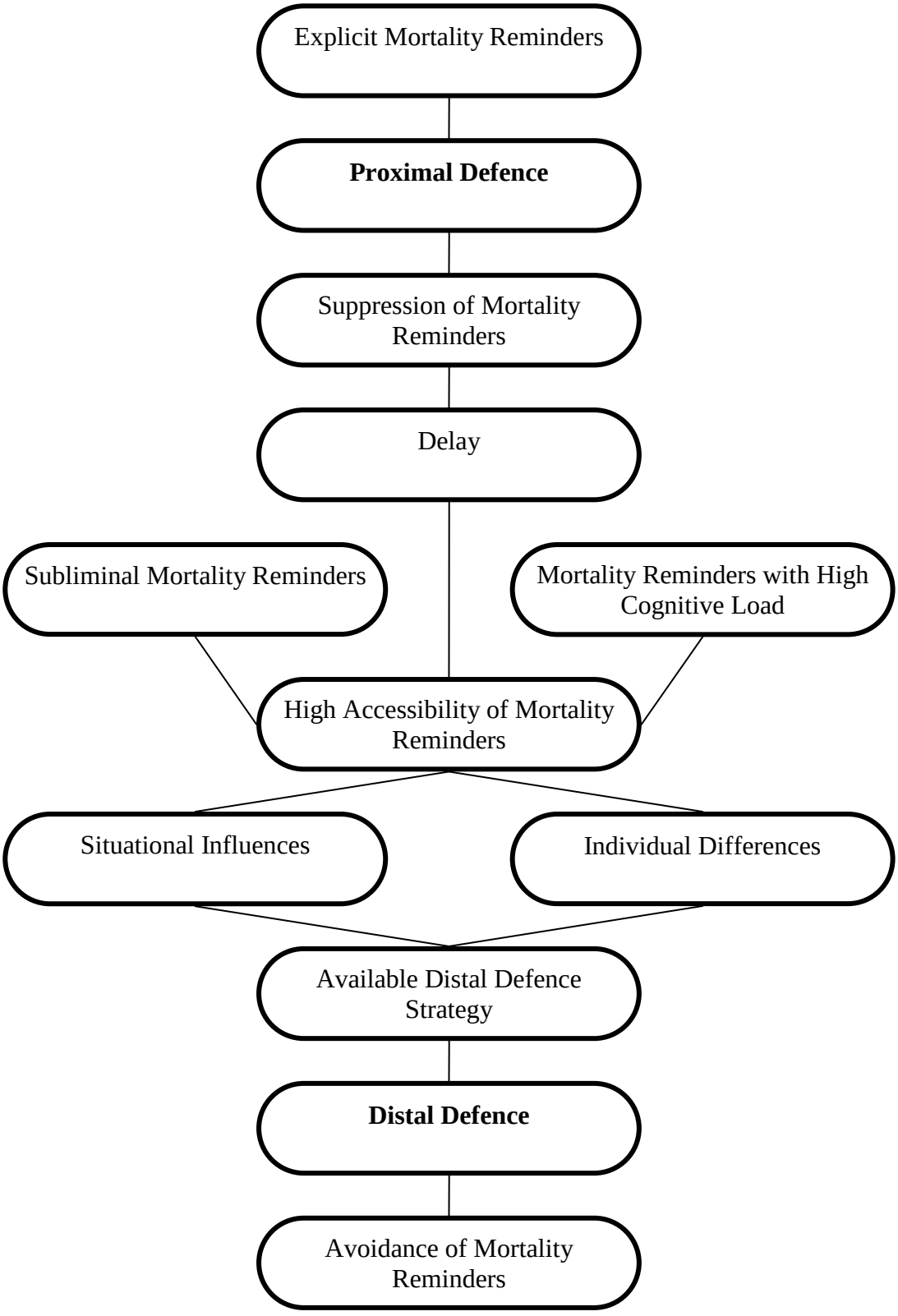

Figure 2.1: Temporal Sequence for Proximal and Distal Defence Processes (adapted from Arndt et al., 2002)

It should be noted that this "Dual Processing Theory" of proximal and distal defence processes towards existential anxiety posited by TMT researchers appears to be at odds with other theories of how emotion shapes behaviour. For instance, Baumeister, Vohs, DeWall & Zhang (2007) have put forward an alternative dual processing theory which suggests that people's emotional responses tend to operate as a feedback system where there is a distinction between how automatic affect and conscious emotions affect their behaviour. Baumeister and colleagues suggest that people tend to initially experience automatic affective responses towards emotionally arousing situations. These automatic affective responses constitute immediate positive or negative emotional feedback towards the emotionally arousing situation via their amygdala (e.g. the arousal of the sympathetic or parasympathetic branches of the Autonomic Nervous System), which can trigger instantaneous behavioural responses in individuals. An example of such a behavioural response following automatic affect is fleeing from a snake that one encounters in long grass (i.e. the sympathetic branch of the Autonomic Nervous System is activated and one flees immediately before taking a more conscious decision towards some action). After this immediate affective response has taken place, Baumeister et al. (2007) argue that people tend to consciously experience more specific emotions as a way of learning from the emotionally arousing situation. To return to the previous example, after fleeing from a snake that one encounters in long grass, one might experience the conscious emotion of fear towards snakes. This conscious emotion may then lead one to avoid situations where one may encounter snakes in the future such as walking through long grass in the particular area where the emotionally arousing situation occurred. Furthermore, if one encounters a similar situation in the future, Baumeister et al. (2007) argue that one might experience an immediate automatic affective response towards that situation which may lead to immediate action. For instance, when one finds oneself at the area of long grass where a snake was previously encountered, one may experience an automatic affective response (i.e. arousal of the sympathetic branch of the Autonomic Nervous System), which may lead one to avoid the scene.

An extension of this theory was subsequently proposed by Baumeister & Masicampo (2010) in their theory of conscious thought. Like Baumeister et al. (2007), these authors argued that bodily and sensory responses towards stimuli in the environment

(such as automatic affective processes) tend to occur in the absence of consciousness. In contrast, Baumeister & Masicampo (2010) argue that conscious thought tends to occur as a reconstructive process that involves the collecting together of past experiences that have been encountered by an individual via automatic bodily and sensory responses and reassembling these images or memories of experiences into meaningful sequences of thoughts. These sequences of thoughts can lead an individual to experience conscious emotions, which have adaptive potential as indicated by Baumeister et al. (2007), or they can subsequently be used as a communicative tool to teach others what one may have learnt from experience. Alternatively, such conscious thoughts about prior experiences can lead to the mental simulation of possible behavioural scenarios, which can be adaptive for exploring options in complex decisions. Similarly, the simulation of possible behavioural scenarios can be helpful in understanding the perspectives of others in one's social environment that may be in the process of encountering similar situations which one may have experienced in the past. In this way, Baumeister & Masicampo (2010) argue that all conscious thought tends to arise from the re-structuring of prior bodily and sensory experiences and that such thought may have unique adaptive advantages.

It is clear that Baumeister et al.'s (2007) theory of emotional feedback and Baumeister & Masicampo's (2010) theory of conscious thought appear to contradict the Dual Processing Theory proposed by TMT. Specifically, while TMT authors distinguish between conscious proximal defences and pre-conscious distal defences towards existential anxiety, these experiences are distinct from conscious emotions or thoughts about emotionally arousing situations and automatic affect as they appear to occur in an inverse relationship. In other words, while Baumeister and colleagues (2007, 2010) suggest that pre-conscious emotional responses tend to occur before conscious emotions or thoughts, TMT authors argue that conscious thoughts of death tend to precede pre-conscious reactions towards death. Nonetheless, this seeming disparity between the theories of Baumeister and colleagues (2007, 2010) and TMT can be accounted for when one considers the apparent uniqueness of existential anxiety as an emotion. Firstly, existential anxiety appears to be distinct from other forms of emotion that involve the re-structuring of prior bodily and sensory experiences since the individual who thinks about death does not necessarily need to have experienced death or a near-death experience. As a consequence, it appears

likely that conscious thoughts about death tend to precede preconscious reactions towards existential anxiety in the manner proposed by TMT. Additionally, in contrast to other emotions such as fear which can be measured by self-report and physiological measures, existential anxiety appears to be a pre-contemplative form of anxiety towards the concept of death that often cannot be directly measured in the same way. For instance, Rosenblatt et al. (1989) found that asking participants to think about their death did not significantly increase their physiological arousal from baseline responses. Nonetheless, they demonstrated the potential indirect emotional effects of existential anxiety in their study by the findings that those participants who were asked to think about their death tended to significantly increase their negative reactions towards cultural violators compared to controls. Similarly, Greenberg et al (1995) found that participants who had been asked to think about an upcoming exam tended to self-report significantly more negative affect than controls on the Positive and Negative Affect Scales (PANAS) but that asking participants to think about death did not significantly increase self-reports of negative affect on the PANAS in comparison to controls. However, their participants who were asked to think about death displayed significantly greater negative reactions towards cultural violators than control participants and participants who had been asked to think about an upcoming exam. Following such findings, it appears that existential anxiety may be a unique type of emotion that does not normally lead to concrete emotional expressions but may lead to indirect effects on thought and behaviour. Indeed, Becker (1973) and the central proponents of TMT (e.g. Solomon et al., 1997) propose that existential anxiety does not tend to normally be experienced directly as an emotion precisely because people have adapted defence mechanisms that tend to prevent its emotional manifestation. In sum, it appears that existential anxiety may be a unique form of emotion that does not find expression in the same manner as other forms of emotion captured by theories of emotion such as those put forward by Baumeister and his colleagues (2007, 2010) precisely because of the operation of proximal and distal defences.

2.4 Proximal and Distal Defences and Health Behaviours

A growing strand of TMT research concerning proximal and distal defences has begun to look at the sorts of health-related behaviours that people are likely to adopt when mortality is made salient to them. TMT researchers have suggested that when

death anxiety is operating at an unconscious level, defensive behaviours towards this anxiety (i.e. distal defences) are often determined more by their capacity to increase an individual's self-esteem rather than by how healthy or physically protective they are (Routledge et al., 2004; Goldenberg & Arndt, 2008). Specifically, research into the unhealthy effects of distal defences has found that people tend to want to engage in risky activities that may serve to bolster their self-esteem such as illicit drug-taking (Hirschberger et al., 2002), risky sexual behaviours (Taubman - Ben-Ari, 2004), smoking (Arndt et al., 2009; Hansen, Winzeler & Topolinski, 2010; Martin & Kamins, 2010), using tanning beds (Routledge et al., 2004; Arndt et al., 2009), reckless driving (Taubman - Ben-Ari et al., 1999; Taubman -Ben-Ari, et al., 2000; Taubman - Ben-Ari & Findler, 2003; Jessop et al., 2008; Arndt et al., 2009), scuba-diving (Miller & Taubman - Ben-Ari, 2004) or military activities (Taubman - Ben-Ari & Findler, 2006) when death thoughts are below conscious awareness. It is important to note that a particular risky behaviour must be relevant to an individual's self-esteem before they are likely to adopt it as a distal defence strategy (Taubman - Ben-Ari et al., 1999). Indeed, TMT researchers argue that people often undertake risks in order to avoid subsequent reminders of their mortality either because denial of the probability of death makes them less sensitive to risks or because they overemphasize the potential gains (e.g. to their self-esteem) that they might receive from such risk-taking behaviours (Miller & Taubman - Ben-Ari, 2004). However, people do not always engage in risky behaviours when death anxiety is on the fringes of consciousness. For instance, it has been demonstrated that death anxiety that is below conscious awareness can also lead to increases in an individual's interest in health-promoting behaviours like exercise if the behaviours are relevant to their sense of self-efficacy (Arndt et al., 2003) or if the health-promoting behaviours are relevant to the person's self-esteem (Arndt et al., 2009). Furthermore, TMT authors suggest that people tend to adopt either risky or health-oriented behaviours when they are in a distal mode of defence against mortality reminders to the extent that such behaviours either allow them to perceive themselves as valuable cultural contributors or serve to boost or maintain their sense of self-esteem (Goldenberg & Arndt, 2008).

In contrast, when death anxiety is operating at a more conscious level, TMT researchers argue that people use pseudo-rational methods to deny vulnerability to risk-taking behaviours, avoid risk-taking behaviours altogether or display greater

willingness to engage in health-promoting behaviours (Goldenberg & Arndt, 2008). Research into these proximal defences has found that conscious thoughts of death lead people to exhibit increased intentions to exercise (Arndt et al., 2003), increased intentions to use sun-screen (Routledge et al., 2004), increased avoidance of stimuli that enhance their self-awareness (Arndt, Greenberg, Simon, Pyszczynski & Solomon, 1998; Silvia, 2001) and increased denial of their vulnerability to a health threat (Greenberg et al., 2000; Arndt, et al., 2007). This demonstrates that people who are presented with explicit mortality reminders use whatever means are readily available to deny their vulnerability to risks to their health or to distract themselves from these risks (as per Pyszczynski et al., 2000). Goldenberg & Arndt (2008) have also suggested that an individual will be more likely to engage in a particular form of proximal defence to the extent that the behaviours associated with such a defence are readily available to them and have the capacity to remove existential concerns. In line with this latter point, Arndt et al. (2003) have proposed that proximal defences could be used to encourage health-promotion, as this type of defence can involve an increased desire to engage in health-promoting behaviours if such behaviours are made explicitly available to people and are deemed to be self-efficacious to them.

2.5 Terror Management Health Model (TMHM)

Following the establishment of the sorts of proximal and distal defences in relation to health-related behaviours described above, Goldenberg & Arndt (2008) developed TMHM in order to account for how awareness of death can differentially lead to proximal or distal defensive behaviours depending on whether mortality reminders are either operating below conscious awareness or are within an individual's conscious focus. The central idea behind the TMHM is that, depending on the level of conscious activation of mortality reminders and the availability of resources to defend against such reminders, an individual will adopt either the available proximal defence strategy that functions most effectively to remove mortality reminders from their awareness or the available distal defence strategy that best operates to place themselves at a remove from mortality reminders so that they may not re-enter their conscious awareness. Additionally, there are three specific propositions of the TMHM; each of which is described in the paragraphs that follow.

The first proposition of the TMHM is that an individual will engage in threat-avoidance or health-oriented behaviours in the face of conscious mortality reminders to the extent that one or other of these proximal defensive strategies is effective in facilitating the removal of the mortality reminders from immediate cognisance. However, self-oriented defences that may be used as distal defensive strategies (e.g. engaging in behaviours that relate to an individuals' sense of self-esteem) should not function to remove mortality reminders from conscious awareness.

The second proposition of the TMHM states that, when mortality reminders are just below one's conscious awareness, an individual's health decisions will often be determined more by the relevance of such health decisions to their worldviews and self-esteem rather than the capacity for such health decisions to benefit their health. In this way, health-oriented or risky health decisions will be adopted by the individual to the extent that these behaviours either serve to position them as important contributors to their cultural worldview or serve to boost their self-esteem. An important exception to the assumption of this proposition that health motivations will be less imminent when thoughts of death are non-conscious is where an individual's desire to be healthy is itself a source of self-esteem. Indeed, as Goldenberg & Arndt (2008) note, esteem-relevant health behaviours may be particularly useful in preventing mortality reminders from re-entering one's cognizance in such instances. Additionally, if one's health status is under existential threat, behavioural patterns which function to remove this threat or place it at a distance could be seen to boost one's esteem.

The third and final proposition of the TMHM suggests that non-conscious mortality reminders that involve a degree of awareness about one's own body should inform the health behaviours one chooses to adopt as a distal defence measure. More specifically, when the physical or creaturely aspects of humans are primed and these mortality reminders are below conscious awareness, this proposition suggests that an individual will seek to engage in health behaviours that are less bodily-oriented (e.g. health screenings) in order to avoid the potential for these behaviours to remind them of their own creaturely nature. Figure 2.2 below provides a broad illustration of the central points of the TMHM and its three central propositions (derived from Goldenberg & Arndt, 2008).

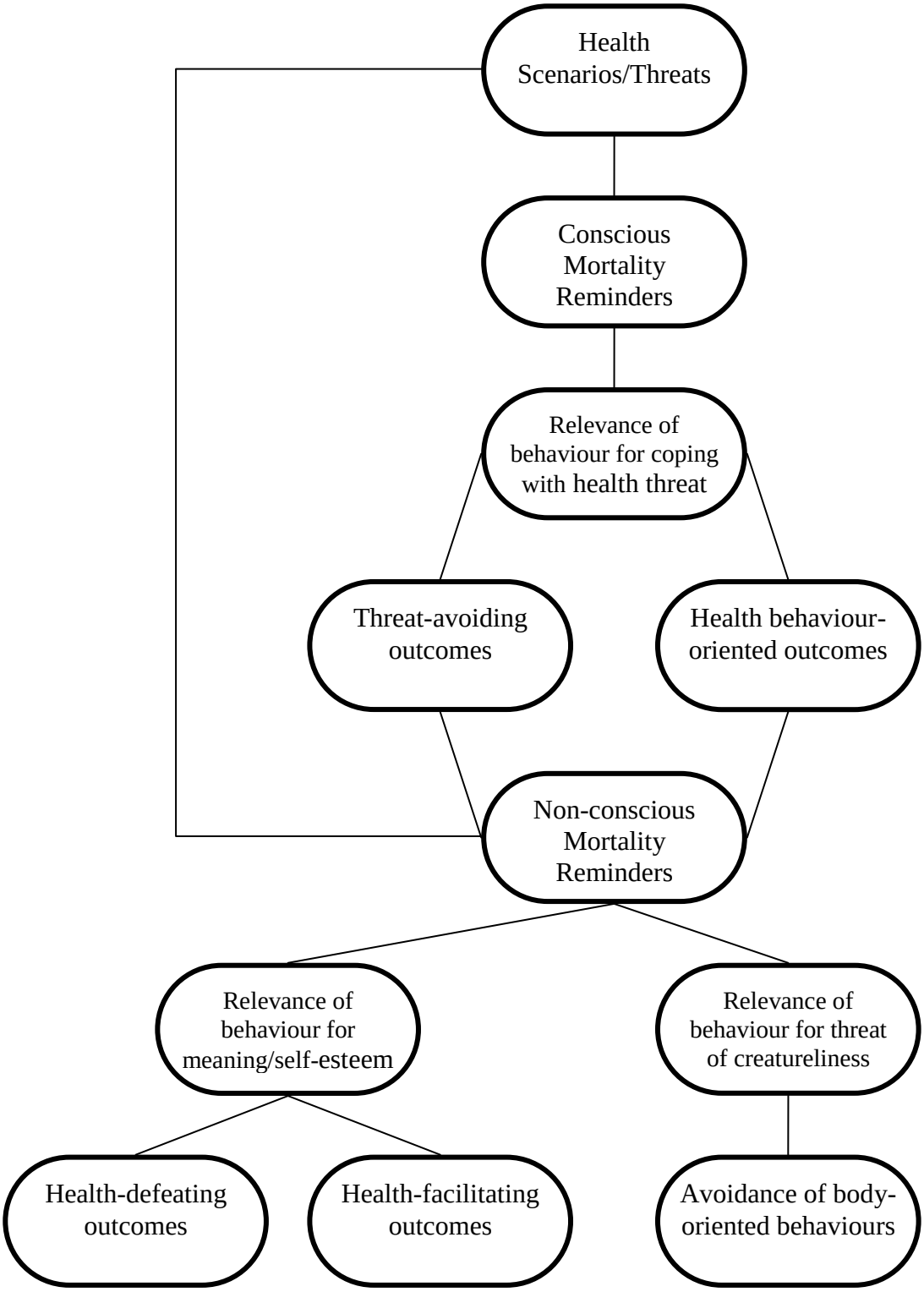

Figure 2.2: Visual Illustration of the TMHM (adapted from Goldenberg & Arndt, 2008)

2.6 TMT and Health Threat Detection Behaviours

Recent TMT research (some of which has been explicitly derived from the TMHM described above) has looked at how anxieties concerning death can act as a barrier to health threat detection behaviours like cancer screening. Although a number of TMT

studies had previously demonstrated that proximal defence strategies involving the denial of one's vulnerability to a health threat are typically employed as a means to avoid health-related information that has the potential to provide mortality reminders (e.g. Greenberg et al., 1993; Greenberg et al., 2000), one of the first research programmes to explicitly investigate whether patterns of defensive avoidance are adopted by individuals in response to mortality reminders was carried out by Arndt et al. (2007). Across five studies, these authors examined the cognitive associations between cancer and death-related thoughts and some of the potential implications of such associations for cancer-screening behaviours.

In the first three studies in their programme, Arndt et al. (2007) demonstrated that thinking about developing cancer and its effects on the body can prompt people to initially suppress thoughts concerning death. In fact, their research indicated that getting participants to think about what would happen to them when they developed cancer (i.e. "Cancer Salience") prompted more death-thought suppression than getting participants to think about what would happen to them when they died (Studies 1 & 2). Additionally, these authors found that there was an increase in the accessibility of death-related concepts among participants either when they were primed to think about cancer under conditions of high cognitive load (i.e. by having to mentally rehearse a 10-digit number; Study 2) or when they were subliminally primed to perceive the word cancer (Study 3). However, while two of these studies were sufficiently powered (Study 1 contained a sample size of 50 participants in preparation for a 3x1 ANOVA and Study 3 contained a sample size of 55 participants for a 3x2 repeated measures ANOVA), there was an insufficient sample size of 44 participants in Study 2 in preparation for a 2x2 ANOVA. It should also be noted that these first three studies in their research programme tended to focus on male or female participants separately (e.g. Studies 1 and 2 in their research programme focused on female participants alone and Study 3 in their research programme contained 43 men and 11 women). Despite such limitations, when taken together these studies support the propositions that there is an immediate spreading activation from the concept of cancer to the concept of death and that cancer-related thoughts are also potentially more threatening than thoughts about death, thereby leading to an increased suppression of death-related thoughts following cancer-related thoughts. Arndt et al. (2007) argued that this increase in the suppression of death-related

cognitions associated with thoughts concerning cancer may reflect the fact that cancer represents a more tangible manifestation of death rather than an abstract representation of death. Consequently, they suggested that thoughts about cancer may be more threatening to an individual than thoughts concerning death, leading to sustained proximal defences towards confrontations with cancer.

In addition to demonstrating the effects of thinking about cancer on the suppression of death-related concepts, Arndt et al. (2007) were interested in how such processes might affect people's health decisions in the more ecologically valid context of thinking about one's risk for developing cancer. More specifically, they were interested in whether cancer-related suppression would have substantial effects on an individual's intentions to perform cancer screening behaviours. Firstly, in Study 4 of their programme of research, the authors gave forty female participants bogus information that related a growth hormone linked to a person's height with breast cancer. Specifically, they informed half of their participants that they were at risk for breast cancer on the basis of their height and half of their participants that they were not at risk for breast cancer on the basis of their height. Immediately after receiving this information, each participant was presented with a task to complete that had been designed to measure the accessibility of death-related thoughts. In line with health psychology literature of a similar nature (e.g. Jemmott et al., 1986; Croyle et al., 1993), they found that those female participants who were led to believe that breast cancer was not relevant to their health did not suppress thoughts about cancer as much as those who were led to believe that they were at-risk for cancer. Additionally, the authors examined the potential effects of thinking about cancer on individuals' intentions to participate in screening behaviours in Study 5 of their research programme; a highly powered study which contained a total of 83 participants in preparation for a 2x2 ANOVA. In this study, female participants expressed lower intentions to perform breast self-exam behaviours and male participants expressed lower intentions to perform testicular self-exam behaviours after thoughts about cancer were made salient to them and they were placed under a high cognitive load relative to controls who had thoughts about asthma made salient to them. In other words, participants who were in a distal mode of defence tended to express lower intentions to perform health-oriented behaviours relating to cancer screening;

presumably because such health-oriented behaviours had the potential to threaten their health status.

Some more recent TMT research has specifically focused on how mortality-related concerns can affect women's perceptions and intentions relating to breast cancer screening practices. Goldenberg and colleagues (2008) found that reminding women about their own mortality by presenting them with an essay that emphasised the similarity between humans and other animals led to defensive avoidance of breast self-exam cancer screening behaviours compared to control participants who were given an essay that emphasised the distinction between humans and animals. More particularly, across three studies, these TMT researchers demonstrated that the awareness of human creatureliness can i) lead younger women to reduce their intentions to conduct breast self-exams after receiving a Mortality Salience task and subsequent distraction, ii) lead younger women to conduct shorter exams on a plastic breast model, and iii) lead older women to perform shorter breast self-exams on themselves. Such findings are consistent with a notable meta-analysis pertaining to breast self-exams from the health psychology literature, where it was uncovered that two of the main reasons for avoiding breast self-exams were anxiety relating to the procedure and fear of cancer (Brett et al., 2005). Furthermore, each of these studies were highly powered; the first two studies contained 93 female undergraduate participants and 84 female undergraduates respectively, while the third study used a highly ecologically valid sample of 99 women aged 35 and over who were deemed to be at greater risk for breast cancer.

In two further studies, Goldenberg and colleagues (2009) also found that mammograms may pose an existential threat to both younger and older adults. In the first of these studies (n = 89), creaturely reminders led younger women who were high in neuroticism (i.e. due to their high scores on the Neuroticism subscale of the Eysenck Personality Inventory) to be less willing to imagine undergoing a mammogram when their mortality had been made salient to them compared to highly neurotic younger women who had their mortality made salient to them and were given reminders of human uniqueness. In the second of these studies, Goldenberg et al. (2009) further examined the existential threat posed by mammograms with a more ecologically valid sample of 84 women aged between 38 and 77. Highly neurotic

older women from this study who were given creaturely reminders just before they received a mammogram perceived a greater amount of discomfort with the procedure compared to highly neurotic older women who were given reminders of human uniqueness before they received a mammogram. These findings show that creaturely reminders can have significantly negative effects on women's intentions to perform gender-relevant cancer screening practices and can even have negative effects on their experiences of such practices.

Rather than exhibiting such patterns of avoidance, Cooper, Goldenberg & Arndt (2011) found that women who were attending a mammography clinic for a mammography screening were more likely to display intentions to perform breast self examination when breast self exams were framed as empowering rather than when breast self-exams were framed as having a practical value (Study 1). Similarly, in a second study in their research programme, these authors found that women who were given information about breast cancer that contained mortality reminders and were subsequently distracted were more likely to report a heightened sense of empowerment after performing a breast self-exam framed as empowering than either women who did not receive a mortality reminder or women who were not exposed to the message that breast self-exams may be empowering.

2.7 Point-of-Care Testing (POCT)

POCT refers to any form of diagnostic testing that may be performed outside of a central clinical laboratory and at the point of patient care (Willmott & Arrowsmith, 2010). Due to the potential for POCT devices to be used at point of patient care settings such as the home, a patient's workplace or school, a General Practitioners' offices, a mobile nursing practice, an ambulance, an emergency department or an intensive care unit in a hospital, POCT is generally regarded as a form of diagnostic testing that will aid immediate and appropriate action towards a potential health risk (e.g. Price, St. John & Hicks, 2004; von Lode, 2005). A key objective of this sort of testing is to provide rapid test results that will help to quickly generate appropriate treatment decisions for patients and improve clinical or economic outcomes (Price, 2001). As such, these devices tend to be designed to be easy to use in order to assist in the immediate ruling in or out of a potential diagnosis, to reduce the number of steps required necessary for the detection of a significant health threat and to aid in

appropriate health decisions that may be made even by patients themselves at the point of care (Price et al., 2004).

Some of the qualities that are considered ideal for POCT devices are portability, robustness, ability to reliably cope with small sample sizes, ability to produce accurate results in a timely fashion, amenability to quality control checks and ease of use and maintenance (Willmott & Arrowsmith, 2010). With this in mind, modern POCT devices have developed to the point where they are extremely easy to use and very reliable if they are handled correctly and operated according to specific guidelines (Price et al., 2004). These devices are particularly useful in the "ruling in" of a diagnosis to enable appropriate action, "ruling out" of a diagnosis or health-related judgement and in situations where the test results suggest that the implementation of an intervention or modification of a current intervention for a patient's chronic disease would be beneficial to their prognosis (Price, 2002). POCT can also assist in the reduction of errors associated with clinical laboratory testing that relate to the misidentification of blood or tissue samples and the reduction of problems associated with sample collection and transport such as contamination and incorrect result interpretation (Drenk, 2001). This is because POCTs, such as the so-called "lab-on-a-chip" technologies, eliminate some potentially unnecessary steps in diagnosis such as washing processes between sample preparations (Lee, Kim, Chung, Demirci & Khademhosseini, 2010) and can remove the need for sample storage and transportation by allowing for testing to occur in situ on disposable "cassettes" (von Lode, 2005). There are also economic advantages associated with POCT such as the reduction of costs associated with central laboratory services, transport costs for samples, reduced length of stay in the Emergency Department and more appropriate or rapid triage of patients. These advantages of POCT have been demonstrated consistently in a variety of experimental and clinical trials (e.g. Kendall, Reeves & Clancy, 1998; Hudson, Christenson, Newby, Kaplan & Ohman, 1999; Altieri & Camarca, 2001; McCord et al., 2001; Price, 2001; Stubbs & Collinson, 2001; Christenson & Collinson, 2004; Cramb, 2004; Price et al., 2004; Yang & Zhou, 2006; Dittmer et al., 2010; Du et al., 2011).

A growing trend in POCT is the development of miniaturized and user-friendly diagnostic devices. The increased miniaturization of POCT devices means that

sizeable equipment and resources associated with central clinical laboratory services no longer need to be used in cases where an appropriate POCT device may be available. Specifically, such miniaturisation is thought to offer reductions in sample volumes and reagents associated with diagnostic testing, which could lead to smaller and more portable devices at lower manufacturing costs compared to many of the current central laboratory systems (von Lode, 2005). Similarly, the user-friendliness of such devices means that hospital staff and even patients themselves can learn to use these devices without having to undergo the extensive training of a laboratory clinician (e.g. Hicks, 2004; Spriggs, 2004). These developments have had the effect of moving certain forms of diagnostic testing that were previously confined to the central clinical laboratory towards hospital bedsides, ambulances and home settings (Bissell & Sanfilippo, 2002). The use of POCT at hospital bedsides has been found to give nurses a sense of empowerment as they can get results quickly and discuss them with a physician or act on them directly (Hicks, 2004). Point-of-care self-testing in home settings also has the effect of empowering patients with chronic conditions (e.g. Spriggs, 2004). Nonetheless, there are some recognised problems with POCT, including inefficient or inappropriate use, inappropriate maintenance and storage of the devices and accompanying chemical reagents, transmission of infection resulting from inappropriate sterilisation and risks associated with misinterpretation of results (Plebani, 2009). As a result, POCT guidelines suggest that laboratory personnel should be involved in the selection of devices, training of individuals to perform POCT for cardiac markers and the maintenance of equipment (e.g. Gouget, Barclay & Rakotoambinina, 2001; Nichols et al., 2007; Christenson & Azzazy, 2009). The most common POCT devices are the blood glucose monitors used by diabetics (Chan, Rozmanc, Seiden-Long & Kwan, 2009). Other common forms of POCT include blood coagulation monitors for haemophiliacs, salivary assays for the detection of HIV and serological diagnostic testing for rheumatoid arthritis.

2.8 CVDs and POCT with Cardiac Markers

A CVD is any disease that affects the heart itself or the system of blood vessels leading to and from the heart, including Coronary Heart Disease, stroke and other circulatory diseases. Such diseases are the number one cause of death globally each year (World Health Organisation, 2011). In Ireland, approximately 10,000 people die each year from CVD (Irish Heart Foundation, 2012) and sudden cardiac arrest as a

result of some form of CVD kills approximately 5,000 people every year (Irish Heart Foundation, 2011). CVDs are typically caused by the narrowing of a person's coronary arteries (those arteries that supply blood directly to the heart muscle tissue or myocardium) due to the build-up of fatty deposits or "plaques" along the inner walls of these arteries, often as a result of elevated plasma cholesterol, smoking, hypertension and obesity. Such a build-up of plaques in an individual's arteries can lead to an inadequate supply of oxygen and nutrients to their heart (called "cardiac ischemia"). Sustained cardiac ischemia often results in myocardial infarction (the complete blockage of the supply of blood to the heart, more commonly known as a "heart attack") or heart failure (the weakening of the heart muscle to such a degree that it can no longer pump enough blood to meet the demands of the body).

There are several reasons for the emergence of CVD-related POCT devices. Firstly, it has been estimated that between 35-70% of patients presenting at emergency departments with chest pain are false positives, producing negative economic consequences (McCord et al., 2001). Over-the-counter CVD-related POCT devices would remove the necessity for many of these patients to present themselves to emergency departments. Conversely, it is estimated that approximately 2-5% of myocardial infarction patients are incorrectly discharged from emergency departments in the United States each year, accounting for the highest incidence of medical malpractice lawsuits against emergency department physicians, according to the National Academy of Clinical Biochemistry Laboratory Medicine (Nichols et al., 2007). Indeed, a current report has indicated that the number of false-negative discharges for myocardial infarction is particularly high in Ireland, at an estimated 5% of discharged patients receiving an incorrect diagnosis (McDonnell, Hearty, Leonard & Kennedy, 2009). The development of CVD-related POCT devices for use by GPs who have easy access to their patient's medical records could remove the potential for such problems.

On a related note, primary prevention of CVD has been regarded as particularly important due to the large number of fatalities or disabilities that occur after a primary coronary event (Kanstrup et al., 2002). Indeed, while myocardial infarction and its related syndromes often manifest in easily identifiable symptoms such as angina pectoris (severe chest pain due to a lack of oxygen to the heart muscle), fatigue or

dyspnea (shortness of breath), heart failure symptoms are non-specific, its clinical signs are not particularly sensitive and many diagnostic tests that are easily available are not always accurate enough to aid in a correct diagnosis (Peacock, 2002). The de-centralised testing of CVD from laboratory settings would potentially resolve these sorts of mounting issues.

Following some of these growing concerns in CVD detection and an escalating global interest in disease prevention, there has been a recent increase in the development of new POCT diagnostic instruments for the assessment of an individual's risk for developing CVD and that can be used without the need for a clinical laboratory (Christenson & Collinson, 2004). It is ultimately hoped that the development of these sorts of devices will de-centralise CVD diagnostic testing by providing quick and easy-to-use technologies that test for cardiac distress and provide a stratification index for an individual's future risk of developing CVD (McDonnell et al., 2009). Encouragingly, the POCT devices that have been developed so far (using biochemical markers of cardiac injury, also referred to as cardiac markers) have been consistently found to improve turn-around times and length of hospital stays for cardiac patients (e.g. Hudson et al., 1999; Altinier et al., 2001; Christenson & Collinson, 2004; Christenson & Azzazy, 2009). The use of such devices has also been found to allow all investigations and management decisions regarding cardiac risk resulting from suspected cardiac-related symptoms to be performed within a single clinical visit, thereby reducing the need for follow-up clinical visits (Cowie et al., 2003) and these devices have started to become a central part of therapeutic and interventional guidelines for individuals who are at risk for developing CVD (Christenson & Azzazy, 2009).

In addition to such benefits, the investigation and use of cardiac markers in POCT has moved the diagnostic study of diseases within the bracket of CVD away from the biomedical concept of "acute myocardial infarction" as a cut-off point for the indication of myocardial injury towards a degree of "acute coronary syndromes" (e.g. Apple et al., 2006; Yang & Zhou, 2006; Body, 2008; Ryan et al., 2009; Scirica, 2010). Consistent with the emerging concept of continuous myocardial injury (Wu et al., 1999), acute coronary syndromes vary from myocardial infarction to very minor heart problems like unstable angina, where myocardial injury indicated from cardiac

markers is reversible and does not yet correspond to CVD (Christenson & Azzazy, 2009). POCT devices that use biomarkers of myocardial injury can provide a convenient route to the timely diagnosis, prognosis, monitoring and risk stratification of acute coronary syndrome (Azzazy & Christenson, 2002), whereby reversible myocardial injury can be detected at an early stage and dealt with before the onset of CVD (Rathore et al., 2008). The rapid ruling-in or ruling-out of an acute myocardial infarction can also be delivered in ambulance or emergency room settings by serial measurements of cardiac markers (Stubbs & Collinson, 2001). These biomarkers may also be helpful for quickly diagnosing individuals who present to an emergency setting with suspected cardiac problems but obtain an uninterpretable ECG reading or have atypical symptoms (Hudson, et al., 1999).

The cardiac markers used in these devices are proteins detectable at elevated levels in the bloodstream during the development of CVD, or after myocardial injury has taken place (McDonnell et al., 2009). Appendix A describes some of the most common cardiac markers that are used in POCT; Myoglobin, Creatine-Kinase-MB (CKMB), Cardiac Troponin T (cTnT), Cardiac Troponin I (cTnI), B-type natriuretic peptide (BNP) and C-Reactive Protein (CRP). Ideally, cardiac markers for use in POCT should be highly sensitive, highly specific, released quickly by the body and would remain elevated for a lengthy timeframe (Yang & Zhou, 2006). Unfortunately, such criteria have yet to be met with any of the current cardiac markers when they are measured individually (McDonnell et al., 2009).

Following this limitation of CVD POCT-related devices which take singular measurements of cardiac markers in this fashion, there has been a growing trend towards diagnosis based on the use of several cardiac markers in combination in order to provide better risk stratification for mortality and myocardial injury (e.g. Newby et al., 2001; McCord et al., 2001; Ng et al., 2001; Ordóñez-Llanos et al., 2006; Kurihara et al., 2008; McCann et al., 2008; Rathore, Knowles, Mann & Dodds, 2008; McCann et al., 2009; Oemrawsingh et al., 2011). There is growing evidence to suggest that multiple markers help to speed up the ruling out of acute myocardial infarction and prevent unnecessary admissions to clinical settings (Aldous, in press). Diagnostic devices which analyse multiple cardiac markers together have also been found to determine the presence or absence of abnormal concentrations of several cardiac

markers in combination in an individual's bloodstream within a shorter time-frame than central laboratory testing methods (Yang & Zhou, 2006).

The use of these devices typically involves placing a small quantity of blood onto a gel test strip or microfluidic chip that contains groups of antibodies which bind specifically to particular cardiac markers (Hudson et al., 1999). In order to allow the blood sample to flow along these test strips or chips into the detection zones where the groups of antibodies are located, nanostructures such as plastic capillaries or colloidal microbeads are typically embedded into the flow channels to optimise the speed of blood flow into these areas (e.g. Lee et al., 2010; Du et al., 2011). Clinical trials with such devices have found that they are rapid and easy to use without sacrificing analytic performance (e.g. Kurihara et al., 2008), that they can identify significantly more "marker-positive patients" than laboratory-based single-marker testing (e.g. Newby et al., 2001) and that they can aid in the rapid discharge of hospitalised patients that are in the low-intermediate risk category (e.g. Rathore et al., 2008). For example, using the "Triage® Cardiac Panel" (Biosite) involving the point-of-care measurement of 3 cardiac biomarkers (cTnI, CK-MB and Myoglobin), Rathore and colleagues (2008) were able to discharge one-third of their patients who had presented to an emergency department with ischemic chest pain.

Although much of the current CVD-related POCT devices have been designed for use in ambulances or emergency departments, it has been suggested that the diagnostic testing of cardiac markers could be extended to primary care settings such as the home and GP's offices (e.g. Christenson & Collinson, 2004; von Lode, 2005). This suggestion is based on the idea that obtaining multiple measures of established cardiac biomarker levels at once can give an indication of early signs of myocardial injury that may be reversible by appropriate preventative steps (Yang & Zhou, 2006; Scirica, 2010). In this way, it is possible that emerging POCT devices for cardiac biomarkers could give an indication of an individual's future risk of developing CVD, thereby allowing for preventative measures to be taken in primary care settings. One such diagnostic device, the CVD Risk Biochip for the detection of future risk of developing CVD, is the main focus of the current research programme.

2.9 The Current Research Programme

The BDI in Dublin City University has proposed a novel POCT system for the rapid and easy assessment of CVD risk. The proposed system itself consists of two components; a "CVD Risk Biochip" and a "CVD Risk Biochip" reader. The "CVD Risk Biochip" (See Figure 2.3) is a small device designed to detect the concentration levels of a number of different cardiac markers (e.g. Myoglobin, cTnI, CRP and BNP) in order to deliver a fast but highly accurate indication of an individual's future risk of developing CVD. In addition to the high specificity of the chemical components involved, the concentration levels of these cardiac markers would be tested on the chip itself in order to minimise the number of steps required to carry out a risk assessment of this kind. In this way, the system that the BDI have proposed would be relatively simple to use in order to enable a quick and easy assessment of cardiac risk.

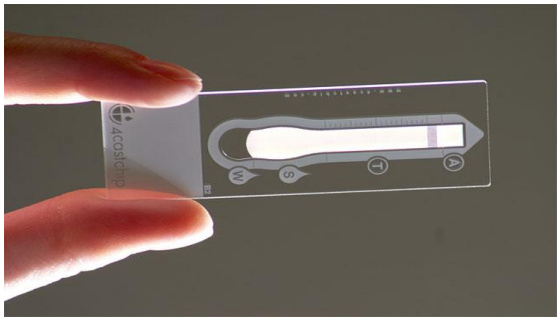

Figure 2.3: CVD Risk Biochip (Approximate Size)

Figure 2.4 illustrates how the proposed CVD Risk Biochip could work. After a small pinprick of blood is taken from the patient, this blood sample would be placed on to the sample zone of the CVD Risk Biochip (Figure 2.4i). Tiny capillary-like structures on the chip would then allow this blood sample to flow from the sample zone across the surface of the chip (Figure 2.4ii) until it reaches a number of individual detection zones (Figure 2.4iii). Each of these detection zones would contain antibodies that specifically bind to a particular cardiac marker and have a fluorescent dye attached to them. Consequently, when the blood sample reaches the detection zones, the cardiac markers that are present in the blood sample specifically bind to the appropriate antibodies that are located in each of these zones and emit a certain amount of fluorescent signal which corresponds to the concentration levels of each of the appropriate cardiac markers that are present in the blood sample.

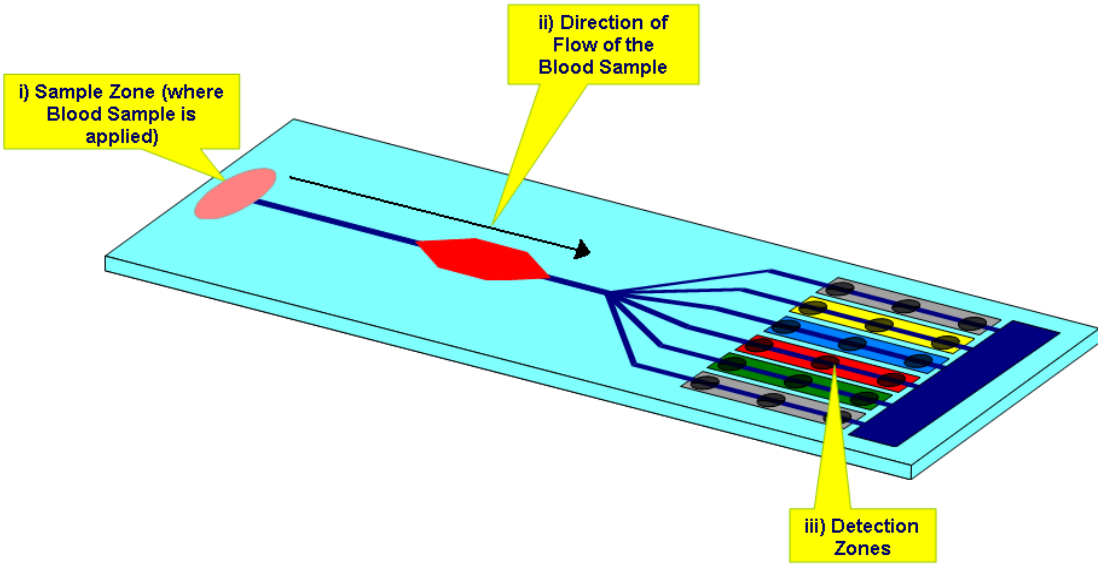

Figure 2.4: Schematic of CVD Risk Biochip (Component Parts)

The chip itself is then inserted into the CVD Risk Biochip Reader (See Figure 2.5) in order to measure the concentration levels of each of the cardiac markers of interest. Once the CVD Risk Biochip is inserted, the CVD Risk Biochip Reader measures the amount of fluorescent signal from each of the detection zones and indicates these concentration levels in a display. When taken together, these concentration levels can be taken to indicate a person's future risk for developing CVD.

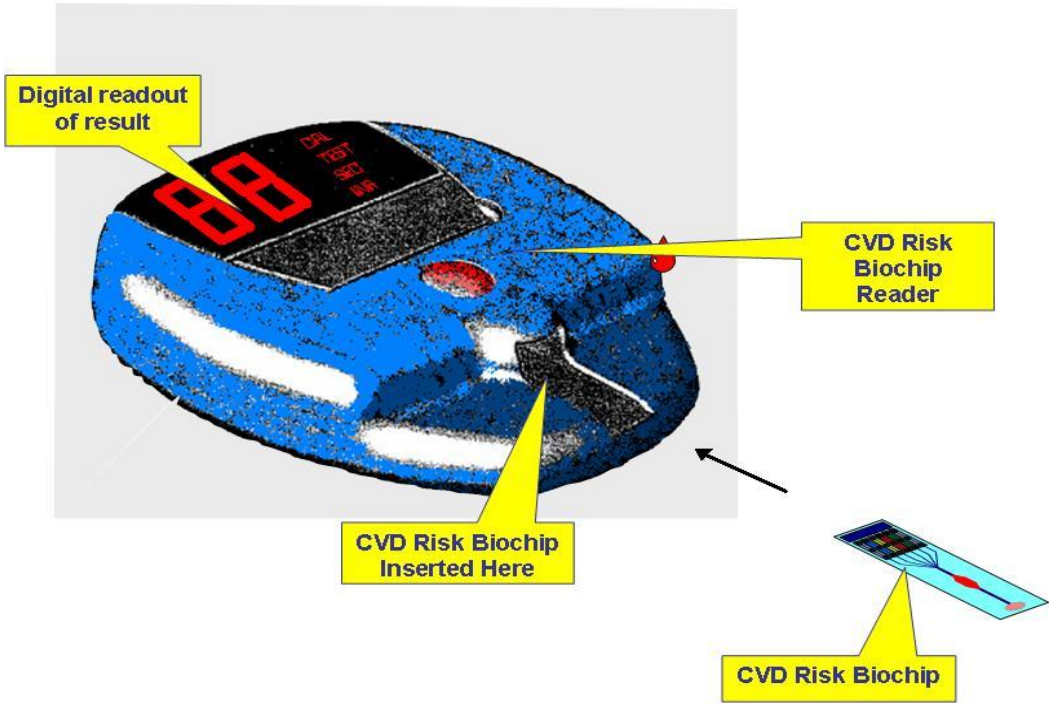

Figure 2.5: CVD Risk Biochip and Reader

The introduction of a device such as the CVD Risk Biochip has the capacity to move CVD risk assessment from its current settings in the hospital and laboratory to GP offices, ambulances and ultimately the home. This would provide benefits to the patient such as the ruling in or out of cardiac ischemia in the home, pre-hospital ambulance testing for patients suspected of suffering from myocardial infarction or heart failure, testing for heart failure in the GP's office and lower costs in the ruling in or out of heart problems than those associated with Electrocardiogram readings (Christenson & Collinson, 2004). By obtaining multiple measures of cardiac biomarker levels at once, the CVD Risk Biochip would also provide a quick indication of any minor damage to the heart that could lead to the later development of CVD. In this way, the CVD Risk Biochip would give an indication of the level of risk that an individual may have of developing CVD, provide GPs and patients with appropriate risk information in order that they may take appropriate steps to prevent the development of CVD and reverse the negative effects of early myocardial damage. However, there are several potential disadvantages in using a device like the CVD Risk Biochip in a POCT setting such as the home in favour of utilising central clinical laboratory services. These limitations include the fact that the device is proposed to measure only a few cardiac markers and the fact that a physician would be able to better interpret the results by referring to a patient's medical history. Furthermore, since CVD is an illness where death is a very real consequence, thoughts about developing the illness may create high levels of anxiety concerning death in the patient that may inhibit their uptake of such a device (e.g. van Steenkiste et al., 2004). Indeed, as discussed extensively above, an analogous effect has already been uncovered in TMT literature relating to cancer screening, where it was found that providing mortality reminders to participants led them to exhibit more defensively avoidant patterns of behaviour towards breast self-examinations, testicular self-examinations and mammograms (Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009).

Following on from such ideas, the current programme of research focused on whether or not existential anxiety could inhibit a person's uptake of the CVD Risk Biochip when such a device is made available for them to use. Specifically, the research programme examined whether or not a background context of existential concerns would lead to defensively avoidant responses towards the device as a distal defence.

The current research programme also focused on priming distal defences in participants in this way because distal defences are thought to be the mode of TMT defence that operate most consistently for people in everyday life (i.e. as thoughts of death and anxiety are not generally in one's focal attention; Muraven & Baumeister, 1997). Distal defences typically involve behaviours or psychological processes which are purportedly adopted as ways of avoiding further reminders of one's mortality in order to prevent such reminders from re-entering conscious awareness (e.g. Greenberg et al., 1994; Pyszczynski et al., 1999; Pyszczynski et al., 2000). In this way, the central studies in the current research programme (Studies 1, 2 and 4) were designed to simulate the sorts of conditions where participants would have been most likely to encounter existential anxiety in relation to the CVD Risk Biochip. In other words, these studies investigated whether or not existential anxiety below conscious awareness would lead people to be more avoidant of the device as a way of sidestepping reminders of mortality that may be associated with its use (i.e. whether or not they would exhibit lower behavioural intentions and commitment towards the device than controls). Additionally, the research programme explored whether or not these individuals would exhibit less favourable attitudes towards the device when existential concerns were just below their conscious awareness compared to controls. In sum, the programme was principally designed to test whether or not existential concerns that are below the level of consciousness could lead to greater defensive avoidance of the CVD Risk Biochip.

In order to further explicate the applied value of these central research questions, it is useful to refer to current research in CVD and the previous TMT research regarding cancer-screening. Firstly, since there are high mortality rates associated with CVD (e.g. CVD has been reported to account for 36% of all deaths in Ireland; Irish Heart Foundation, 2012), use of a device like the CVD Risk Biochip has the potential to indicate that an individual has a high risk for developing CVD; an indication which could be seen to comprise a significant mortality reminder. As a result, the most likely way of avoiding mortality reminders associated with thoughts about using a device like the CVD Risk Biochip would appear to constitute defensive avoidance towards the device. Previous TMT cancer-screening research (e.g. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) and theoretical reviews of TMT health-related research (e.g. Goldenberg, 2005) have also suggested that existential

concerns that are below the level of consciousness can lead to greater defensive avoidance of health-protective behaviours that have a potentially life-threatening component or which involve some degree of confrontation with the human body. Furthermore, according to proposition two of the TMHM (Goldenberg & Arndt, 2008); health-oriented or risky health decisions will be adopted by an individual when mortality reminders are non-conscious to the extent that such behaviours serve to boost their self-esteem or provide protection for them against blows to their self-esteem. In the current research programme, behavioural patterns of defensive avoidance could be seen as an effective distal defence strategy to prevent the potential blow to an individual's self-esteem of receiving information that they are at risk for developing CVD. This idea is derived from health psychology literature which has shown that people often tend to display patterns of defensive avoidance towards certain health-oriented behaviours when they perceive that performing such behaviours could threaten their health status (e.g. Jemmott et al., 1986; Cameron, 1997; Luce & Kahn, 1999; Kahn & Luce, 2003; Brett et al., 2005) and that health threat detection behaviours have generally been found to have a greater capacity to threaten an individual's health status compared to health-promotion behaviours (e.g. Millar & Millar, 1993; Millar & Millar, 1995; Cameron, 1997; Millar, 2006).

In the case of the CVD Risk Biochip, such patterns of "distal defensive avoidance" might resemble the processes depicted in Figure 2.6 below. As illustrated in this diagram, individuals who receive mortality reminders (e.g. thinking about one's own death or thinking about having a heart attack), a distraction (e.g. reading a mundane death-neutral literature passage) and an introduction to the CVD Risk Biochip might exhibit more negative appraisals of the device, lowered behavioural intentions to use the device and lowered commitment to use the device compared to baseline responses on these dimensions.

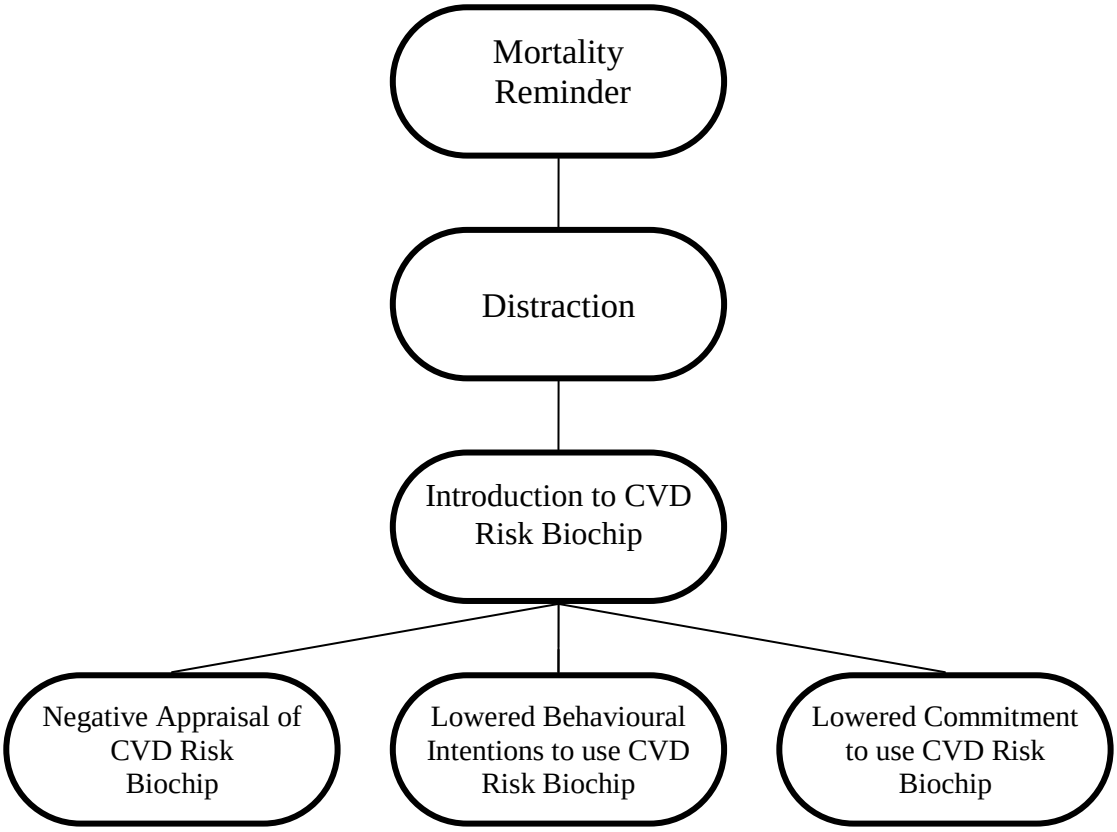

Figure 2.6: Potential Responses towards CVD Risk Biochip following Existential Reminders, a Distraction and an Introduction to the Device.

Following the potential for such patterns of "distal defensive avoidance" with respect to the CVD Risk Biochip, the principal aim of the current research programme was to examine whether or not an individual's experience of existential anxiety below conscious awareness could have an influence on their subsequent attitudes and behavioural intentions towards the device and commitment towards its use. As described above, in accordance with previous research and theoretical accounts that have made predictions about TMT within potentially analogous contexts (Goldenberg, 2005; Arndt et al., 2007; Goldenberg & Arndt, 2008; Goldenberg et al., 2008; Goldenberg et al., 2009), existential anxiety below conscious awareness may inhibit the selective uptake of the CVD Risk Biochip by an individual as a means of avoiding further mortality reminders and this may serve as a means to maintain their self-esteem by circumventing a significant threat to their health status. Simultaneously, existential anxiety below conscious awareness may arouse negative attitudes in an individual towards such a device. In sum, the current research programme was devised in order to evaluate whether or not existential concerns that

are just below someone's conscious awareness could have an effect on their attitudes, intentions and commitments to use the CVD Risk Biochip. By investigating such research questions, the programme constitutes a unique application of TMT to the uptake of POCT devices and seeks to explore the relationship between death-related thoughts and CVD-related events like heart attacks for the first time. Additionally, as with a number of recent TMT research studies involving cancer-screening behaviours (e.g. Goldenberg et al., 2008; Goldenberg et al., 2009), the current research programme extends TMT to middle-aged and older adult participants for its principal research questions rather than employing the typical convenience samples of psychology students used in most of the prior TMT research, thereby providing a potentially more ecologically valid context for the examination of existential concerns.

In line with the above ideas, the first two studies in the current programme of research were constructed in order to investigate whether or not getting participants to think about their own personal death or what would happen to them if they experienced a heart attack (as opposed to reminding them about a control topic such as dental pain), and subsequently distracting them so that these thoughts were at the fringes of consciousness but still readily accessible, would decrease their intentions and commitments to use the device and lead them to elicit more negative attitudes towards the device as a means of sidestepping the potential threat to their health status that use of the device could entail. Following previous TMT research (e.g. Greenberg et al., 1994; Greenberg et al., 2000; Arndt et al., 2007), both of these studies primed participants to experience a distal mode of defence (i.e. an unconscious TMT defence) towards death rather than a proximal mode of defence (i.e. a conscious TMT defence) by furnishing participants with a distraction task to complete after they were asked to think about their own death, having a heart attack or the control topic of dental pain. These studies are documented in Chapters 3 and 4 which follow.

Chapter 3: Study 1

Study 1 was primarily focused on whether or not unconscious existential anxiety would pose a barrier to male and female participants aged over 55 years of age with respect to their intentions and commitment to use the CVD Risk Biochip and whether or not such anxiety would have an impact on their accompanying attitudes towards the device. The study employed participants over 55 years of age as they were deemed to be the most relevant age cohort for this study. More specifically, advancing beyond 55 years of age had been previously identified as the most powerful independent risk factor for developing CVD (World Health Organization, 2004). In addition to seeking the recruitment of an ecologically valid sample of this nature, the current study controlled for potential gender differences in health threat detection behaviours.

TMT research relating existential concerns to health threat detection behaviours has yet to examine health threats for which the risk of development is not specific to a particular gender. Indeed, although the first three of Arndt et al.'s (2007) studies involving participants responses towards thoughts about contracting cancer tended to focus on cancer in a more general sense, these studies focused on male or female participants separately (e.g. Studies 1 and 2 in their research programme focused on female participants alone and Study 3 in their research programme contained 43 men and 11 women). Additionally, their studies which examined behavioural intentions towards cancer screening focused on the gender-specific screening behaviour of breast exam intentions or testicular cancer self-examination intentions (Studies 4 and 5). Similarly, Goldenberg et al. (2008), Goldenberg et al. (2009) and Cooper et al.'s (2011) studies were only relevant to women. However, CVD can be considered to be a set of diseases that is not gender-specific like breast cancer or testicular cancer. For instance, it has been estimated that 5,000 women die from CVDs in Ireland each year (Irish Heart Foundation, 2011); approximately half the estimated average annual mortality rate for CVDs in the country (Irish Heart Foundation, 2012). While such statistics suggest that CVD may be equally relevant to both genders, there is also evidence to suggest that males and females may exhibit different patterns of health-relevant behaviours. For instance, some prior TMT health research uncovered gender-

related differences in the willingness to perform risky health behaviours resulting from existential anxiety (e.g. Hirschberger et al., 2002; Taubman Ben-Ari & Findler, 2003). Furthermore, there is an abundance of health psychology research that suggests that gender is a significant component in the adoption of health-related behaviours.

3.0.1 The Impact of Gender on Health Behaviours

Gender has consistently been found to contribute to individual participation in health-related behaviours (for an extensive review of some pertinent literature pertaining to this area see Courtenay, 2000a). In general, men tend to participate in a greater number of behaviours that are damaging towards their health than women and many studies have demonstrated that men tend to have more severe drinking problems and tend to drink more frequently than women (e.g. McCreary, Newcomb & Sadava, 1999; Huselid & Cooper, 1992; Stillion, 1995). Men are also more likely than women to engage in substance abuse (Cotto et al., 2010). Furthermore, men are more predisposed to participate in a broad range of physically dangerous activities (Garrison, McKeown, Valois & Vincent, 1993). For instance, men are considered to be more reckless drivers than women (Taubman - Ben-Ari & Findler, 2003) and it is estimated that men are three times more likely than women to drink and drive and are less likely to report that they regularly wear a safety belt than women (Centers for Disease Control and Prevention, 2000). Men are also more prone towards using violent behaviour to achieve their ends than women (Wallner & Machatschke, 2009). A corollary of the above findings is that women tend to be less prone to self-destructive forms of behaviour than men.

In addition to engaging in less behaviour that is detrimental to their health and well-being, women have also been found to engage more frequently in health-oriented behaviours and health-seeking information than men (Liang, Shediac-Rizkallah, Celentano & Rohde, 1999). In this regard, women are inclined to report attending a physician more regularly than men (Parslow, Jorm, Christensen, Jacomb & Rodgers, 2004). With regard to cancer screening, women attend screening for colorectal cancer more often than men despite the fact that men have a higher risk of developing this form of cancer (Evans, Brotherstone, Miles & Wardle, 2005), women express greater intentions to participate in screening behaviours associated with cancer detection than

men (Janda et al., 2004) and women have better knowledge of risk factors for cancer (Wardle, Waller, Brunswick & Jarvis, 2001) and warning signs for cancer (Brunswick, Wardle & Jarvis, 2001) than men. Women are also more likely to feel relieved and less likely to feel indifferent towards test screening results than men (Marteau, Dundas & Axworthy, 1997).

There is also consistent evidence to suggest that women tend to cope with stress in a more constructive fashion than men. In this regard, a meta-analytic study by Tamres, Janicki & Helgeson (2002) found that women were significantly more likely to use active coping strategies, to seek social support for both instrumental and emotional reasons and to engage in problem-focused coping compared to men. Furthermore, men were found to consistently use more avoidant patterns of behaviour as a way of coping with personal health problems (Tamres et al., 2002). Elsewhere, it has been found that women generally tend to use a greater number of social support networks than men in dealing with stress (e.g. Baum & Grunberg, 1991; Lynn et al., 2009). Women may even tend to participate in a greater amount of health-related research than men (e.g. Van Wijk, Huisman & Kolk, 1999).

Gender differences in health behaviours have been attributed to stereotype gender behaviours that are culturally conditioned. In this regard, Courtenay (e.g. 2009; 2000a; 2000b; 1998) has argued through social constructionist theory that women and men behave in different ways in their cultural environments due to concepts about femininity and masculinity that are culturally conditioned from birth. For example, boys are encouraged to be less dependent than girls from an early age (e.g. Aries & Olver, 1985; Lytton & Romney, 1991) and are sometimes actively discouraged from seeking help from their parents or other adults (e.g. Fagot, 1984). This idea has been supported by a recent comprehensive research study by Lynn and colleagues (2009) involving 950 participants, which found that women tend to engage in a greater number of reassurance-seeking behaviours linked to health worries than men. Courtenay (2009) also argues that gendered demonstrations of avoiding health behaviours and engaging in risky behaviours are extremely important for men in many developing countries in order to maintain a patriarchal sense of power (e.g. in countries such as India where men are culturally constructed as being more self-sufficient, healthy, physically stronger, and hence, more powerful). As a

consequence, men from these cultures may demonstrate risky behaviours and avoid health-oriented or health-seeking behaviours that they consider to be more feminine in character in order to project a masculine image and to uphold cultural standards of masculinity (e.g. Courtenay, 2000a; Courtenay, 2000b; McCreary, Saucier & Courtenay, 2005).

Although such gender differences in health behaviour patterns appear to be robust, they may decrease with age (e.g. Airey et al., 1999; Liang et al., 1999; Tseng & Lin, 2008). For instance, several studies have found that there is a general pattern of reduced risk-taking behaviours and increased health-enhancing behaviours among both males and females as they get older (e.g. Stoller & Pollow, 1994; Airey et al., 1999). For instance, while young college-going males tend to report being less vulnerable or susceptible to health risks than their female counterparts (e.g. Boehm et al., 1993), this difference may diminish by older age (e.g. Liang et al., 1999; Tseng & Lin, 2008). This could be seen to result from fixed gender roles of younger male adults giving way to increasing concerns about diseases and health status as they grow older (e.g. Stoller & Pollow, 1994; Apostolidis et al., 2009). However, self-efficacy with respect to the health behaviours involved may have an important role in this pattern (Grembowski et al., 1993). Moreover, this moderating effect of age on gender differences in relation to health behaviours is only supported in some of the literature on this topic; there has been some research to suggest that gender differences in health behaviours persist in older adults (e.g. Chan & Jatrana, 2007). As a result, the moderation of gender differences in health behaviours with age requires further investigation in order to confirm or deny whether or not these effects are reliable and generalisable to multiple populations of participants. Consequently, a decision was made to include gender as a covariate in each of the planned analyses in the current study that related to attitudes, behavioural intentions and commitment to use the CVD Risk Biochip in order to control for potential gender differences on these dimensions.

3.0.2 The Current Study

While factoring in gender and age-related concerns in the manner described above, the current study examined whether or not unconscious existential anxiety would have an impact on older adults' reactions towards the CVD Risk Biochip. More

specifically, the current study investigated if getting people to think about their own death (Mortality Salience) would decrease their intentions to use the device and lead to more negative attitudes towards it compared to participants who were asked to think about a control topic. Following previous TMT research relating to cancer-screening (e.g. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009), it was predicted that participants over 55 years of age would exhibit less favourable attitudes towards the CVD Risk Biochip and would be less likely to express behavioural intentions or commitments to use the device after they were made aware of their mortality and subsequently distracted when compared to participants who did not have their mortality made explicitly salient to them.

This study also investigated whether or not asking people to think about having a heart attack (i.e. "Heart Attack Salience") and then distracting them from these thoughts would similarly decrease their intentions to use the CVD Risk Biochip and lead them to elicit more negative attitudes towards the device than controls. Indeed, if CVD is associated with thoughts of death, priming thoughts relating to the former should increase thoughts about the latter through a spreading activation between the concepts of CVD and death (e.g. Arndt et al., 2002; Arndt et al., 2007). Following this logic, one group of participants in this study were primed to think about "heart attacks". Participants were asked to "think about having a heart attack" rather than being asked to "think about developing CVD" because it was reasoned that a heart attack represents a significant CVD-related event that is particularly tangible and occurs at a specific point in time. In contrast, since CVD may develop over a number of years, thinking about developing CVD may represent a less tangible and vaguer temporal event. Another reason for using the term "heart attack" over CVD arose from the possibility that participants may not have known what the term CVD explicitly meant, whereas "heart attack" is a term that is used in common parlance and is a major component of CVD. Following these considerations, it was predicted that participants would display less favourable attitudes towards the CVD Risk Biochip and would be less likely to express behavioural intentions or commitments to use this device after they were asked to think about having a heart attack and were subsequently distracted relative to participants who were asked to think about a control topic.

3.1 METHOD

3.1.1 Design

This study incorporated a three group independent measures design as a function of the salience task that participants received. Participants were randomly assigned to the Control condition, the Mortality Salience condition or the Heart Attack Salience condition respectively. The study employed the block randomisation method with respect to the questionnaire booklets that participants received; allowing for participants to be equally allocated to each group as the recruitment progressed. Since the effect sizes for studies involving a Mortality Salience induction are typically quite large (average Cohen's d = 1.2, as reported by Arndt & Vess, 2008), the study contained 13 participants per cell in order to obtain sufficient statistical power of 0.80 (as per the tables provided by Cohen, 1992) in preparation for a three group MANCOVA design with two dependent variables (i.e. a total of 78 participants).

3.1.2 Participants

Seventy-eight participants over 55 years of age volunteered to participate (35 males and 43 females). Recruitment was carried out via contact with Active Retirement Groups and additional organizations accessible to the researcher that contained individuals within this age range. A named person from each of these groups established initial contact with group members and introduced the research study to them as one that related to "aspects of health and better ways of knowing about your health". Those participants who indicated an interest in participating in the study were contacted independently by the researcher with a view to arranging individual or group meetings where the research could be conducted in a controlled environment (e.g. in a boardroom or office). When a controlled environment was not readily available, participants completed the questionnaire in their homes, where they were supervised to ensure that they were not distracted and that each of the sections of the questionnaire were completed in the order in which they were presented. Additionally, before taking part, all participants had to confirm that they had never experienced a significant negative heart-related event (e.g. a heart attack) on the Consent Form (Appendix B1) that they were given to sign and complete.

3.1.3 Procedure

Ethical approval was sought and granted for the programme from the Dublin City University Research Ethics Committee. Before participating, all candidates were given a Plain Language Statement (Appendix B1) to read. This Plain Language Statement indicated that they were free to withdraw at any time, acknowledged the source of funding and confirmed that all data would be stored anonymously and confidentially. Potential participants were then given the opportunity to ask any questions that they had in relation to the Plain Language Statement and Questionnaire Booklet. Once they were satisfied, those who agreed to take part in the study proceeded to sign a Consent Form (Appendix B1), where they indicated their intention to participate and confirmed that they had never experienced "a negative heart-related event (e.g. a heart attack)".

Once they had completed and signed the Consent Form, participants were given one of three possible Questionnaire Booklets (see Appendix C1-C3 for the Mortality Salience Questionnaire, the Heart Attack Salience Questionnaire and the Control Questionnaire respectively). They were instructed that each Questionnaire Booklet contained various sections that would require them to give their attitudes and opinions on various topics, including questions relating to health and healthcare. In particular, participants were instructed that they would be asked to give their opinions on a novel diagnostic device that was currently being developed, which they were assured was a genuine device. The first part of the questionnaire booklet included either a Mortality Salience task, or a Heart Attack Salience task or a Control task, depending on the condition to which the participant was assigned. This was followed by a distraction task taken from the TMT literature, information on the CVD Risk Biochip, a measure of attitudes towards the device, a measure of behavioural intentions to use the device and a novel measure which gave participants the opportunity to commit to using the device. Participants were instructed to complete each section in the questionnaire in the order presented and not to skip between sections. Completion of one of the Questionnaire Booklets took an average of about 20 minutes. Afterwards, participants were debriefed by the researcher as to the full nature of the study and they were each given the opportunity to discuss any queries or concerns that they may have had in relation to the study. A Debriefing Sheet (Appendix G1) was also given to participants to take away. This Debriefing Sheet contained slightly more detailed

information concerning the design, aims and objectives of the study than the information that had been provided to participants in the debriefing session.

3.1.4 Materials

3.1.4a Mortality Salience/Heart Attack Salience/Control Tasks

Participants received a Mortality Salience task, a Heart Attack Salience task or a Control task. The Mortality Salience task is the most widely used task in TMT studies, having been used in over a hundred TMT studies as a way of reminding people about their mortality (e.g. Burke et al., 2010). The task consists of two open-ended questions that allow participants to explicitly think about their own death and what may happen to them when they physically die. These questions are "Please briefly describe the emotions that the thought of your own death arouse in you" and "Jot down, as specifically as you can, what you think will happen to you as you physically die and once you are physically dead". As described above, the Heart Attack Salience task was developed specifically for this study in order to allow participants to explicitly think about having a heart attack and what would happen to their bodies if they were to experience a heart attack. In this way, the Heart Attack Salience task removed the word "death" from the two open-ended questions and replaced it with the word "heart attack". The Control task was analogous to the other tasks and involved replacing the subjects "death" or "heart attack" with "dental pain" (a similarly aversive topic that does not relate to issues surrounding mortality; e.g. Greenberg et al., 1995).

3.1.4b Distraction Task

Prior TMT research has established that individuals engage in distal defences when thoughts of mortality are just below their conscious awareness (e.g. Pyszczynski et al., 1999). Therefore, a distraction task is typically administered to participants in TMT research in order to allow conscious mortality concerns to subside before the dependent measures are introduced. The distraction task used in this study consisted of a short literary passage for participants to read accompanied by a couple of questions which were purported to assess participants' opinions about certain aspects of the passage. The passage itself was an extract from "The Growing Stone" short story by Albert Camus (1957), taken from "Exile and the Kingdom". This extract and

the accompanying questions have been used as a distraction task in this way in several prior TMT studies (e.g. Greenberg et al., 1994).

3.1.4c CVD Risk Biochip Information Sheet

The distraction task in the Questionnaire Booklets was followed by an information sheet regarding the CVD Risk Biochip. This information sheet was developed in consultation with a core member of the BDI in order to accurately represent the proposed workings of the CVD Risk Biochip. Scientific references and technical words were replaced, where possible, with lay terms and the information sheet was designed to conform to Plain Language guidelines (e.g. Plain English Campaign, 2008). Several diagrams illustrating the workings of the CVD Risk Biochip were also included with permission from the BDI.

3.1.4d CVD Risk Biochip Attitude Scale

A CVD Risk Biochip Attitude Scale was developed for the current research study in order to specifically tap into participants' attitudes towards the CVD Risk Biochip. The scale took the form of a series of opinion statements rated on a 5-point Likert scale, from 'strongly disagree' to 'strongly agree'. Items focused on attitudes towards diagnostic testing for patient use (e.g. "Moving diagnostic testing from hospital settings to the home is a great idea."), emotional reactions towards the device (e.g. "The CVD Risk Biochip makes me feel anxious and intimidated") and evaluations of its usefulness (e.g. "The CVD Risk Biochip will encourage people to take a more active approach to their health"). Several of these items were developed with reference to the content of items from the Krantz Health Opinion Survey (KHOS; Krantz, Baum & Wideman, 1980). For instance, the item from the KHOS "It's almost always better to seek professional help than to try to treat yourself" was modified to become "Diagnostic testing should be left to the professionals".

3.1.4e CVD Risk Biochip Behavioural Intention Scale

The CVD Risk Biochip Behavioural Intention Scale used in the Questionnaire Booklets contained 3 items adapted from the "Breast Self Exam Intention Questionnaire" that had been used in previous TMT literature (e.g. Arndt et al., 2007; Goldenberg et al., 2008). These items measured participants' current feelings about using the CVD Risk Biochip (e.g. "At this moment, the thought of using the CVD

Risk Biochip is particularly unappealing") and represented differing degrees of emotion at the thought of using the CVD Risk Biochip in the future. Three additional items were also developed to assess participants' potential future intentions to use the CVD Risk Biochip (e.g. "If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it").

3.1.4f "De Facto Intentions" Measure

The back page of the questionnaire invited participants to sign up for a pilot study involving the CVD Risk Biochip. This page gave the following instructions to participants:

> The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details on the sign-up sheet that you will now be presented with. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead.

Below these instructions, a space was provided for participants to provide their name and contact details. This sign-up sheet was included as a way of measuring participants' "De Facto Intentions" to use the device (i.e. their commitment to use the device in the future). Any of the sign-up sheets that contained a participant's contact details were separated from the remainder of the Questionnaire Booklets and kept in a location that remained separate from the Questionnaire Booklets in order to ensure the confidentiality and anonymity of participants. The anonymous Questionnaire Booklets that had contained a sign-up sheet with contact details were also marked in order to account for which participants had indicated their commitment to use the device in the proposed pilot study.

The central rationale behind the use of the sign-up sheet in the current study was to control for the possibility that hypothetical bias might have had an impact on participant's responses to the behavioural intentions items, since it was reasoned that

participants in this study may have been uncertain that the CVD Risk Biochip was a genuine device, despite the assurances of the researcher. Hypothetical bias refers to an individual's overestimation of their potential performance of a particular behaviour in a situation where the presence of a hypothetical scenario places the possibility of the individual's performance of the behaviour in question at a distance (Ajzen, Brown & Carvajal, 2004). Such biases have often been found in health psychology literature, where weak links are frequently reported between behavioural intentions and actual behaviour (e.g. Morrwitz, Johnson & Schmittlein, 1993; Sutton, 1998; Sheeran, 2002; Bhattacherjeea & Sanford, 2009; Carrington, Neville & Whitwell, 2010). Research into hypothetical bias has also found weak links between peoples' attitudes and their actual behaviours (e.g. Fazio & Williams, 1986; Leippe & Elkin, 1987; Ajzen & Sexton, 1999; Ajzen, 2000). Despite these problems, the "corrective entreaty" method suggested by Cummings & Taylor (1999) has been found to successfully reduce hypothetical bias by instructing participants to specifically picture themselves in the hypothetical scenario of interest (e.g. Brown, Ajzen & Hrubes, 2003; Ajzen et al., 2004). Such a methodology has the potential to remove the tendency for participants to overestimate readiness to perform socially desirable behaviours and underestimate readiness to perform socially undesirable behaviours through their commitment to performing the behaviour of interest (Ajzen et al., 2004). Following this, the current study provided participants with the opportunity to commit to using the device in a proposed pilot study, thereby attempting to circumvent the potential for hypothetical biases that may have been present in the attitudes and behavioural intentions scales. In this way, it was hoped that the De Facto Intentions measure would tap into participants' actual intentions to use the device.

3.1.5 Pilot Evaluation

An initial pilot phase of the questionnaire booklets was carried out to ensure that the questionnaire items were easy to understand and made sense to participants and that the instructions to participants were clear. Within this pilot phase, the first 10 participants were given a pilot evaluation questionnaire after completing the research questionnaire. This pilot evaluation questionnaire asked each participant whether or not they found any aspect of the Questionnaire Booklet that they received to be unclear or ambiguous and to specifically indicate if there were any items that they found to be ambiguous, misleading or difficult to understand. The pilot evaluation

questionnaire also asked participants to indicate how long it took them to complete the Questionnaire Booklet (15-20 minutes on average). None of these participants found any of the questions to be ambiguous, misleading or difficult to understand and each of them indicated that they found the questionnaire to be interesting and easy to read. This finding was not unusual, as all of the information sheets and questions were developed with reference to Plain Language guidelines (Plain English Campaign, 2008). Consequently, it was decided that none of the information in the Questionnaire Booklets needed to be revised or reworded and that the pilot data could be used in later data analyses.

3.1.6 Ethical Issues

There were a number of ethical considerations with regard to the current study, which were raised at the time that Ethical Approval was sought from the Dublin City University Research Ethics Committee.

One component of this study that could have been seen to contain a mild risk for participants was the completion of the Mortality Salience task, which asked participants to think about their own death. This is because participants may have become significantly distressed at the prospect of having to write about their own personal death. However, in comparison to other aversive events, Mortality Salience does not appear to elicit observable increases in negative affect on self-reports or physiological measures of anxiety (Greenberg et al., 1992b; Greenberg et al., 1995). For example, Studies 2 and 3 of Greenberg et al (1995) found that asking participants to think about death did not significantly increase self-reports of negative affect on the Positive and Negative Affect Scales (PANAS) in comparison to controls who had been asked to think about television. In contrast, participants who had been asked to think about an upcoming exam were found to self-report significantly more negative affect than controls. Additionally, discussions of death and mortality are encountered by most people in everyday life (e.g. by reading a newspaper report, hearing of a neighbour's death or attending the funeral of a loved one). Therefore, it was argued that getting participants to think about death and mortality should not constitute a risk that is greater than one which is normally encountered in everyday life. It should also be noted that TMT authors have never reported that any of their participants had become extremely upset or distressed in reaction to the Mortality Salience task.

Whereas some participants may have expressed slight discomfort at the prospect of thinking about their own death, they have always indicated in debriefing sessions that they did not object to being asked to think about this topic and that they did not find it to be particularly stressful (Tom Pyszczynski, personal communication, 26th August 2008). The same was found to be the case with participants in the current study, although one individual declined to participate further upon encountering the Mortality Salience task. Nonetheless, this individual did not appear to be distressed about the prospect of completing this task; instead she indicated that she would simply prefer not to complete the task.

In a similar vein, the Heart Attack Salience task could have been seen to contain a mild risk for participants as it had the potential to trigger unpleasant memories about past experiences with heart disease (e.g. due to the death of loved ones from heart problems). However, in the same way that people encounter the issues of death and mortality on a daily basis, heart problems and issues surrounding CVD risk are frequently discussed in newspapers and other forms of media (e.g. advertisements for heart attack panic buttons or statistics on the prevalence of CVD). Additionally, in their study on Cancer Salience, Arndt et al. (2007) did not find that their participants were overly distressed at the prospect of thinking about developing cancer. Therefore, if thinking about developing cancer did not provoke significantly high levels of distress among Arndt et al.'s (2007) participants, it was reasoned that it would be unlikely for participants in the current study to find thoughts about having a heart attack to be overly distressing, as the level of threat associated with both of these types of thought could be considered to be broadly similar (i.e. cancer and heart attacks both have high mortality rates). Finally, in order to control for the possibility that people who had previously suffered from heart problems might become emotionally distressed by the Heart Attack Salience task, the Consent Form contained a statement where participants had to confirm that they had never experienced a significant negative heart-related event (e.g. a heart attack).

An additional potential concern in the current study was that its true nature was hidden from participants. Although this may be seen as a mild form of deception, it is important to note that certain psychological research questions require an element of deception in order to avoid the conscious reactions of participants towards the

variables of interest (Bröder, 1998). This was true of the current study because it involved the effects of existential anxiety on participants' attitudes and behavioural intentions. If participants had known that the study involved the effects of existential anxiety on their attitudes and intentions to use the CVD Risk Biochip, they may have biased their responses (Bröder, 1998). Many previous studies have used a similar method to this one in order to remove such biases. According to Section 8.07 of the American Psychological Association's "Ethical principles of psychologists and code of conduct" (2002), deception in psychological research is permitted if it has been determined that non-deceptive methods are not feasible and that the deception is justified by the applied value of the study in question. The current study could be seen to have had significant applied value in its potential for uncovering a barrier to people's willingness to engage in health-promoting behaviours and, consequently, the mild deception was considered to be justified. Additionally, it should be noted that participants in TMT studies have not been found to become upset or distressed by this mild deception in hundreds of studies with thousands of participants that have used a similar methodology to this one (Tom Pyszczynski, personal communication, 26th August 2008). Finally, a thorough debriefing was given to participants after they completed a questionnaire that revealed the purpose of the study, any deceptions used (such as the full nature of the research study and the purpose of the De Facto Intentions Measure), and why they were needed to study the question at hand. No participants raised any concerns or complaints over how the study was conducted.

3.1.7 Data Analyses

3.1.7a MANCOVA Analysis

In order to assess if there were differences in a participants' positive or negative appraisal of the CVD Risk Biochip as a function of their experimental condition, a one-way between-groups multivariate analysis of covariance (MANCOVA) was planned for the attitudes and behavioural intentions data as dependent variables with gender included as a covariate. Despite the fact that the design of the current study could be seen to contain two high-threat conditions (i.e. Heart Attack Salience and Mortality Salience) and a neutral condition, thereby potentially increasing the possibility of a Type II error, a three-group MANCOVA was deemed appropriate in this case for a couple of reasons. Firstly, Heart Attack Salience is a novel measure for priming existential threat that had never been used in any prior TMT studies.

Consequently, this measure could not be clearly assumed to represent either a high, medium or low-threat condition. Additionally, it was deemed necessary to conduct a three group MANCOVA rather than two separate MANCOVAs between each of the respective high threat groups and the control group in order to avoid capitalising on chance. More specifically, since multiple statistical tests of significance can significantly increase the likelihood of committing a Type I error (e.g. Hair, Black, Babin, Anderson & Tatham, 2007) and Type II are less serious than Type I errors in behavioural science research (e.g. Gravetter & Wallnau, 2000), it was deemed more appropriate to conduct a single MANCOVA on the three groups.

It was also deemed necessary to include gender as a covariate in this analysis for a number of reasons. Firstly, the plethora of research on gender differences in health behaviours has suggested that men are less likely to perform health-oriented behaviours than women, particularly when these sorts of behaviours involve health threat detection of some kind (e.g. Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004). This effect has also been corroborated by some prior TMT literature, which noted gender differences in the willingness to perform risky behaviours (e.g. Hirschberger et al., 2002; Taubman Ben-Ari & Findler, 2003). Additionally, although some research has suggested that this effect diminishes as individuals become older (e.g. Airey et al., 1998; Liang et al., 1999; Tseng & Lin, 2008), some research has suggested that gender differences in health behaviours persist in older adults (e.g. Chan & Jatrana, 2007). Consequently, it was deemed necessary to remove any potential bias in attitudes and behavioural intentions towards the CVD Risk Biochip as a function of gender by including this variable as a covariate in subsequent analyses.

3.1.7b Logistic Regression

A logistic regression was planned for the De Facto Intentions Measure as a dependent variable in order to assess if a participant's gender or assignment to one of the three experimental groups would help to predict the odds of whether or not they chose to sign up for the purported pilot study pertaining to the CVD Risk Biochip. As with the MANCOVA, gender was included in the logistic regression model from the outset in order to control for the potential differences between males and females in pursuing

health-oriented behaviours (e.g. Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004).

3.2 RESULTS

3.2.1 Sample Characteristics

Demographic information pertaining to the total sample is given in Table 3.1.

Variable	N	%
Age		
55-64	54	69.2
65+	24	30.8
Gender		
Male	35	44.9
Female	43	55.1

Table 3.1: Demographic Information for Study 1

3.2.2 Descriptive Statistics

Participants had given a rating for each item on the CVD Risk Biochip Attitude Scale and the CVD Risk Biochip Behavioural Intentions Scale on a 5-point Likert scale, from 1 = "Strongly Agree" to 5 = "Strongly Disagree". However, prior to analyses, all items on these scales that were negatively phrased (e.g. "The CVD Risk Biochip will only serve to frighten people about their health") had their scores reversed so that all of the values reflected the same directionality. What remained was a 5-point scale, from 1 = highly negative to 5 = highly positive behavioural intentions or attitudes towards the device. The mean and standard deviations for the individual items in the Attitudes and Behavioural Intentions Scales are provided in Tables 3.2 and 3.3 respectively and reflect these re-scored values.

	Mortality Salience		*Heart Attack Salience*		*Control*		*Total*	
Item	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. The CVD Risk Biochip is an exciting new device.	4.35	0.75	4.58	0.64	4.35	0.69	4.42	0.69
2. Diagnostic testing should be left to the professionals.	2.54	1.39	2.62	1.39	2.50	1.33	2.55	1.36
3. The CVD Risk Biochip makes me feel empowered about my health.	4.08	0.80	3.92	0.89	3.96	0.96	3.99	0.88
4. The CVD Risk Biochip will only serve to frighten people about their health.	3.69	1.29	4.27	0.92	3.35	1.23	3.77	1.21
5. The CVD Risk Biochip is a valuable new device.	4.35	0.69	4.54	0.65	4.23	0.86	4.37	0.74
6. Moving diagnostic testing from hospital settings to the home is a great idea.	3.73	0.92	4.04	1.31	3.85	1.08	3.87	1.11
7. The CVD Risk Biochip makes me feel anxious.	3.77	1.37	4.15	1.26	3.77	1.31	3.90	1.31
8. The CVD Risk Biochip will encourage people to take a more active approach to their health.	4.42	0.64	4.27	0.67	4.04	1.00	4.34	0.79
9. The CVD Risk Biochip is an unnecessary device.	4.27	0.67	4.46	0.95	4.35	0.94	4.36	0.85

Table 3.2: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Attitude Scale by Condition (Re-scored Values)

Item	*Mortality Salience*		*Heart Attack Salience*		*Control*		*Total*	
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.	3.65	1.13	3.19	1.30	2.96	1.59	3.27	1.36
2. If my GP recommended that I use this device, it is highly likely that I would use it.	4.54	0.86	4.58	0.86	4.46	0.91	4.53	0.87
3. The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.	3.73	1.28	3.96	1.28	3.81	1.13	3.83	1.22
4. At this moment, I feel particularly motivated to use the CVD Risk Biochip.	3.65	1.19	3.31	1.44	3.27	1.54	3.41	1.39
5. At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.	3.73	1.22	3.88	1.37	3.65	1.44	3.76	1.33
6. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.	3.85	1.26	4.42	1.07	3.85	1.29	4.04	1.22

Table 3.3: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Behavioural Intentions Scale by Condition (Re-scored Values)

3.2.3 Principal Component Analysis

Principal Component Analysis (PCA) was performed on both the CVD Risk Biochip Attitude Scale and the CVD Risk Biochip Behavioural Intentions Scale. PCA was chosen over Factor Analysis following Hair et al.'s (2007) recommendation that PCA is preferable when the central focus of the analysis is data reduction. A central aim of the analyses was to ensure that all items on each scale represented a single construct (i.e. attitudes towards the CVD Risk Biochip and behavioural intentions towards the use of the CVD Risk Biochip respectively) in order to ensure that there was sufficient statistical power for the planned MANCOVA to follow.

An additional aim of the current analysis arose from the desire to find a central component for each of the scales that contained both positively phrased items and negatively phrased items in order to control for "acquiescence response set" answers. Acquiescence response set is the tendency of certain individuals to respond in agreement to answers on questionnaires, irrespective of their content (Cronbach, 1946), and has long been regarded as a threat to the validity of scale development. One way to control for acquiescence response set is to vary the valency of questions in a scale so that they are phrased in both positive and negative ways (Winkler, Kanouse & Ware, 1982). Following this logic, the wording of the items on each scale had been varied so that the CVD Risk Biochip Attitude Scale contained five positively-valenced items and four negatively-valenced items, while the CVD Risk Biochip Behavioural Intentions Scale contained three positively-valenced items and three negatively-valenced items. Additionally, it was deemed necessary for a potential construct arising from the PCA to contain several responses that were positively phrased and several responses that were negatively phrased. In light of this consideration, it was decided that the component that best represented several responses from both negatively phrased and positively phrased answers would be kept for subsequent analysis if two component solutions emerged from the PCA which equally accounted for the percentage of variance exhibited by items in the scale.

3.2.3a PCA of the CVD Risk Biochip Attitude Scale

Before PCA was carried out on the CVD Risk Biochip Attitude Scale data, its suitability for PCA was assessed by observing the correlation matrix and the anti-

image correlation matrix, performing a Kaiser-Meyer-Oklin analysis and running Bartlett's Test of Sphericity. Initial inspection of the correlation matrix revealed many coefficients of 0.3 and above, suggesting that the data might be suitable for PCA. Bartlett's Test of Sphericity (Bartlett, 1954) achieved statistical significance, also supporting the data's suitability for PCA. The Kaiser-Meyer-Oklin (*KMO*) value was 0.82, exceeding the recommended value of .6 (Kaiser, 1974) and most of the Measures of Sampling Adequacy (*MSA*) that were produced in the anti-image correlation matrix were above the recommended value of 0.7 (as per the recommendations of Pett, Lackey & Sullivan, 2003).

Despite the suitability of this data for PCA, one of the items, "Diagnostic Testing should be left to the Professionals", obtained an *MSA* value of 0.67. As indicated above, a central aim for the PCA on the CVD Risk Biochip Attitude Scale was to achieve a resultant component with both negatively phrased and positively phrased items that related to participants' appraisals of the CVD Risk Biochip. Since this particular item did not specifically refer to the device and contained a slightly low *MSA* value, it was determined that the item might represent a different construct to the appraisal of the CVD Risk Biochip (i.e. the item might relate to the broader construct of attitudes towards diagnostic testing). Consequently, this item was removed and the initial suitability analyses were re-run with the remaining eight items. These suitability analyses revealed an improvement in the *KMO* value (0.83), a strengthening of the *MSA* values in the anti-image correlation matrix (all *MSA* values >0.75) and the Bartlett's Test of Sphericity also achieved statistical significance. Accordingly, the remaining eight items were deemed suitable for PCA.

The unrotated PCA solution for these remaining eight items revealed the presence of two components with eigenvalues exceeding 1. These components explained 48.26% and 14.69% of the variance respectively. The scree plot for this analysis also revealed a clear break after the third component. According to Hair et al (2007), it is best for any individual component to account for at least a single variable (i.e. an eigenvalue over 1) in order for that component to be retained for interpretation. Additionally, Pett et al. (2003) note that extracted factors are expected to account for 50-60% of the variance in social science studies. Following these ideas, a decision was made to retain the two components for further investigation. In order to assist the

interpretation of these components, an Oblimin rotation was performed. As per Hair et al.'s (2007) recommendations, in cases where components are only moderately correlated, it may be considered more appropriate to use an oblique rotation like Oblimin. An Oblimin rotation was chosen over a Varimax rotation in this case as the Component Correlation Matrix revealed a moderate correlation of 0.37 between the two components. A result more closely approaching simple structure was obtained from the Pattern Matrix (Table 3.4) rather than the Structure Matrix (Table 3.5). Therefore, the former Matrix was chosen as a means to interpret the component loadings for the rotated solution in line with Pett et al.'s (2003) recommendations.

Item	Component	
	1	**2**
1. *The CVD Risk Biochip will only serve to frighten people about their health.*	0.91	-0.20
2. *The CVD Risk Biochip makes me feel anxious.*	0.76	0.01
3. *The CVD Risk Biochip is an unnecessary device.*	0.67	0.21
4. *Moving diagnostic testing from hospital settings to the home is a great idea.*	0.66	-0.06
5. *The CVD Risk Biochip will encourage people to take a more active approach to their health.*	0.60	0.38
6. *The CVD Risk Biochip is a valuable new device.*	0.52	0.47
7. *The CVD Risk Biochip is an exciting new device*	-0.06	0.88
8. *The CVD Risk Biochip makes me feel empowered about my health*	0.02	0.79

Table 3.4: Pattern Matrix for the Oblimin Rotation Solution for the 8-Item Solution of the CVD Risk Biochip Attitude Scale

Item	Component	
	1	2
1. *The CVD Risk Biochip will only serve to frighten people about their health.*	0.84	0.13
2. *The CVD Risk Biochip makes me feel anxious.*	0.76	0.29
3. *The CVD Risk Biochip is an unnecessary device.*	0.75	0.46
4. *Moving diagnostic testing from hospital settings to the home is a great idea.*	0.74	0.60
5. *The CVD Risk Biochip will encourage people to take a more active approach to their health.*	0.70	0.67
6. *The CVD Risk Biochip is a valuable new device.*	0.64	0.19
7. *The CVD Risk Biochip is an exciting new device*	0.26	0.85
8. *The CVD Risk Biochip makes me feel empowered about my health*	0.31	0.79

Table 3.5: Structure Matrix for the Oblimin Rotation Solution for the 8-Item Solution of the CVD Risk Biochip Attitude Scale

Examination of this Matrix revealed that there were four items that loaded substantially on to the first component, with each of these items obtaining a factor loading above 0.65. Despite this finding, the rotated components revealed the presence of cross loadings on two of the variables in the Pattern Matrix. Although the loadings on these items were higher for the first component, the loadings for both of these items were above 0.3 for the second component. It was also discovered that there were two items that loaded strongly on to the second component. These items were; "The CVD Risk Biochip is an exciting new device" and "The CVD Risk Biochip makes me feel empowered about my health". A decision was made to remove these latter two items and to re-run the PCA analysis on the remaining 6 items. The main rationale for this decision was the consideration that the content of both of these items represented a degree of positive appraisal towards the CVD Risk Biochip. In contrast, the four items with clear strong loadings on the first component contained a mixture of both positively phrased and negatively phrased items. Since the main purpose of this PCA was data reduction and this component appeared to account for a greater percentage of variance explained, it was decided to retain the items in the first component and to re-run the analysis. This component also contained both negatively phrased and positively phrased items concerning

participants' attitudes towards the CVD Risk Biochip, suggesting that it is unlikely that this component contained items with an "acquiescence response set" bias. Additionally, since the oblique rotation may have distorted the loadings of the two items with cross-loadings on both components, these two items were included in the PCA which followed.

Item	1	2	3	4	5	6	M	SD
1. The CVD Risk Biochip will only serve to frighten people about their health.	1.00						3.77	1.21
2 The CVD Risk Biochip is a valuable new device.	0.45	1.00					4.37	0.74
3. Moving diagnostic testing from hospital settings to the home is a great idea.	0.56	0.36	1.00				3.87	1.11
4. The CVD Risk Biochip makes me feel anxious	0.51	0.51	0.25	1.00			3.90	1.31
5. The CVD Risk Biochip will encourage people to take a more active approach to their health	0.50	0.62	0.38	0.49	1.00		4.34	0.79
6. The CVD Risk Biochip is an unnecessary device.	0.45	0.57	0.27	0.58	0.62	1.00	4.36	0.85

Table 3.6: Correlation Matrix and Descriptive Statistics for the 6-Item Solution of the CVD Risk Biochip Attitude Scale

Appropriate analyses of the remaining 6 items revealed that they were suitable for PCA [many correlations >0.3 in the correlation matrix (Table 3.6), a significant Bartlett's Test of Sphericity, a *KMO* value of 0.83 and the remaining *MSA* values >0.7]. The unrotated PCA solution revealed the presence of a single component (see Table 3.7 for factor loadings) as there was only one component with an eigenvalue over one and an examination of the scree plot revealed a clear break after the second component. This component accounted for 56.50% of the variance alone. Although this percentage of variance is slightly lower than the variance explained by the eight-item two-component solution, this solution still managed to account for a realistic

percentage of explained variance in the 50-60% expected range of social science research (as per Pett et al., 2003), and managed to do so with a single component solution. Additionally, this solution supported the current use of PCA to achieve a component solution with a balance of both negatively phrased and positively phrased items. A reliability analysis of these six items revealed a Cronbach's Alpha of 0.82, indicating that the resultant component was highly reliable.

Item	Component 1
1. *The CVD Risk Biochip will encourage people to take a more active approach to their health.*	0.81
2. *The CVD Risk Biochip is an unnecessary device.*	0.79
3. *The CVD Risk Biochip is a valuable new device.*	0.79
4. *The CVD Risk Biochip will only serve to frighten people about their health.*	0.76
5. *The CVD Risk Biochip makes me feel anxious.*	0.75
6. *Moving diagnostic testing from hospital settings to the home is a great idea.*	0.59

Table 3.7: Factor Loadings from the PCA on the 6-Item Solution of the CVD Risk Biochip Attitude Scale

3.2.3b PCA of the CVD Risk Biochip Behavioural Intentions Scale

Suitability of the CVD Risk Biochip Behavioural Intentions Scale data for PCA was once again assessed by observing the correlation matrix and the anti-image correlation matrix, performing a KMO analysis and running Bartlett's Test of Sphericity. The correlation matrix revealed many coefficients of 0.3 and above and Bartlett's Test of Sphericity achieved statistical significance; both supporting the data's suitability for factor analysis. In addition, the *KMO* value was 0.81 and all of the *MSA* values in the anti-image correlation matrix were above the recommended value of 0.7. The unrotated PCA solution also revealed the presence of a single component as there was only one component with an eigenvalue over one and the scree plot revealed a clear break after the second component. This component accounted for 56.57% of the variance alone, which was within the realistic expected range for social science research (as per Pett et al., 2003). This solution also

supported the current use of PCA to achieve a component solution with a balance of negatively and positively phrased items.

A reliability analysis of the six items revealed a highly reliable Cronbach's Alpha of 0.85. However, this reliability analysis also revealed that there would be a potential increase in explained variance by approximately 6% and a very minor increase in Cronbach's Alpha (of 0.005) if the item "I would buy the CVD Risk Biochip if my GP recommended it" was removed. It was reasoned that the increase in explained variance if this item was removed could relate to the finding from the Health psychology literature that older adults tend to follow their GP's recommendations closely with respect to their health (e.g. Schofield, Croteau & McLean, 2005). In other words, the majority of older participants in this study may have responded favourably towards this item due to their high levels of trust for their GPs; a trend in participants' responses which may have reduced the variation in responses towards this item. Indeed, such a reduction in the variation of participants' responses was confirmed when the high mean (4.53) and low standard deviation (0.87) for the item was compared to the other items in Table 3.3. In order to avoid the possibility that participants had responded favourably towards this item because of a cohort-based trend, it was decided to remove this item and re-run the analysis with the remaining five items.

The five items that remained were found to be suitable for PCA as many correlations were greater than 0.3 in the correlation matrix (see Table 3.8), Bartlett's Test of Sphericity returned a significant result, the data had a *KMO* value of 0.81 and all *MSA* values in the anti-image correlation matrix were greater than 0.7. Inspection of the scree plot revealed a clear break after the second component and there was only one component with an eigenvalue greater than 1, leading to the conclusion that a single component solution was suitable in this case (see Table 3.9 for factor loadings relating to this single component solution). As expected from the prior reliability analysis, this component accounted for 62.80% of the variance alone, supporting the use of PCA to achieve a behavioural intentions scale that represented a single construct. A reliability analysis of these five items revealed a similarly highly reliable Cronbach's Alpha of 0.85. Consequently, the five-item solution was retained for further analysis.

Item	1	2	3	4	5	M	SD
1. If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.	1.00					3.27	1.36
2. The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.	0.45	1.00				3.83	1.22
3. At this moment, I feel particularly motivated to use the CVD Risk Biochip.	0.52	0.55	1.00			3.41	1.39
4. At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.	0.52	0.61	0.50	1.00		3.76	1.33
5. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.	0.41	0.54	0.50	0.73	1.00	4.04	1.22

Table 3.8: Correlation Matrix and Descriptive Statistics for the 5-Item Solution of the CVD Risk Biochip Behavioural Intentions Scale

Item	Component 1
1.At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.	0.86
2.At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.	0.81
3.The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.	0.80
4.At this moment, I feel particularly motivated to use the CVD Risk Biochip.	0.77
5.If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.	0.72

Table 3.9: Factor Loadings from the PCA on the 5-Item Solution of the CVD Risk Biochip Behavioural Intentions Scale

3.2.4 Data Clean-up, Tests of Normality and Transformations of the Data Scales

Following PCA, each participant's scores on the remaining six items on the CVD Risk Biochip Attitude Scale were added together to form a composite attitudes score. Likewise, participants' scores on the remaining five items on the CVD Risk Biochip Behavioural Intentions Scale were added to form a composite behavioural intentions score. Tests of normality (Kolmogorov-Smirnov statistics, Shapiro Wilks statistics, histograms with normality plots and Normal Q-Q Plots) on both sets of composite scores indicated a negative skew in the data. Therefore, it was deemed necessary to transform the data in an attempt to approximate normality in each set of composite scores in preparation for the MANCOVA. Following Tabachnick & Fidell's (2001) guidelines, several transformations were attempted for each data set. A logarithm transformation to base 10 (LG10) was deemed most appropriate for the composite set of attitudes scores as it achieved a set of scores that closely approximated a normal distribution, while squaring the behavioural intentions composite scores achieved a result that most closely approached normality. These transformed sets of scores were used in the analyses that followed.

3.2.5 MANCOVA on the Behavioural Intentions and Attitudes Data

Before carrying out the MANCOVA, preliminary checks indicated that the transformed attitudes and behavioural intentions data sets did not violate its underlying assumptions. Specifically, there were no violations of the assumptions of normality, linearity, absence of univariate and multivariate outliers, absence of multicollinearity, homogeneity of variance-covariance matrices, independence of the covariate from the experimental treatment and reliability of the measurement of the covariate. Levene's test of Equality of Error Variances revealed an insignificant result for the attitudes data ($p = 0.82$) but a significant result for the behavioural intentions data ($p = 0.04$). Because of this latter result, the subsequent MANOVA analysis was performed at a reduced alpha level of 0.025, rather than the conventional 0.05 level, as per Tabachnick & Fidell's (2001) recommendations.

The MANCOVA revealed that there were no statistically significant differences between the three groups on the combined dependent variables after controlling for gender as a covariate: $F(4, 146) = 1.21$, $p = 0.31$; Wilk's Lambda = 0.94; $\eta^2 = 0.03$. As a result, no further post-hoc tests of between-subjects effects were deemed

necessary between the groups. Table 3.10 provides Descriptive Statistics for the untransformed dependent variables by condition and covariate of gender. The MANCOVA also revealed no statistically significant differences between males and females on the combined dependent variables: F (2, 73) = 0.79, p = 0.46; Wilk's Lambda = 0.98; η^2 = 0.02.

	Condition	**M**	**SD**	**Gender**	**M**	**SD**
Attitudes Data	*Mortality Salience*	24.23	4.25	*Male*	24.29	4.70
	Heart Attack	25.73	3.86	*Female*	24.70	4.35
	Control	23.58	5.14			
Behavioural Intentions	*Mortality Salience*	18.62	4.50	*Male*	17.69	4.81
	Heart Attack	18.77	4.54	*Female*	18.81	5.44
	Control	17.54	6.35			

Table 3.10: Descriptive Statistics for the Untransformed MANCOVA Dependent Variable Scores by Condition and Covariate of Gender

3.2.6 Logistic Regression of De Facto Intentions

In preparation for a logistic regression analysis, each data point was recoded so that responses on all of the variables represented binary data (i.e. each data point was coded with either a value of 0 or a value of 1 with respect to each of the variables of interest). Firstly, the data from the De Facto Intentions Measure (the dichotomous dependent variable) was coded with a value of 0 to denote that a participant had not signed up for the pilot study and a value of 1 to denote that a participant had signed up for the study. Similarly, gender was recoded so that a value of 0 represented a female participant and a value of 1 represented a male participant. Finally, the condition variable was recoded into two separate binary dichotomous variables. The first of these variables, "MORTCOND", indicated whether or not a participant was a member of the Mortality Salience condition. A value of 1 on this variable represented a participant's membership to the condition and a value of 0 represented a participant's membership to one of the alternative experimental conditions. Similarly, the new variable "HEARTCOND" was coded to indicate whether or not a participant was a member of the Heart Attack Salience condition, with a value of 1 representing a participant's membership to the condition and a value of 0 representing a participant's membership to one of the alternative conditions. A corollary of these values was that a value of 0 on both the MORTCOND and the HEARTCOND variables connoted a participant's membership to the Control condition.

Preliminary checks of the data confirmed that there was an absence of multicollinearity between the independent variables. A test of the full model with three predictors (including the two separate variables to indicate a participant's membership to one of the experimental conditions) against a constant-only model indicated no significant differences; X^2 (3, n = 78) = 1.62, $p > 0.05$. This result indicated that neither membership to one of the experimental conditions nor gender helped to reliably predict whether or not a participant had signed up for the pilot study pertaining to the CVD Risk Biochip. Table 3.11 shows regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals relating to odds ratios for each of the three predictors.

Variables	***B***	**Wald Chi-Square**	**Odds Ratio**	**95% Confidence Interval For Odds Ratio**	
				Lower	Upper
MORTCOND	-0.17	0.09	0.85	0.28	2.57
HEARTCOND	0.55	0.84	1.73	0.53	5.64
Gender	-0.18	0.14	0.84	0.32	2.16
Constant	0.55	1.45	1.73		

Table 3.11: Logistic Regression Analysis, Containing Regression Coefficients, Wald Statistics and Odds Ratios for the Predictors and the Constant term and 95% Confidence Intervals Relating to Odds Ratios for the Predictors

3.2.7 Content Analyses of the Open-ended Salience Measures

A series of content analyses of participants' responses to the open-ended salience measures was conducted in order to investigate if either Heart Attack Salience or Mortality Salience primed more thoughts about death than the control measure. Following Arndt et al.'s (2007) content analyses of their "Cancer Salience" measure, two independent coders (the researcher and an additional coder who was unaware of the exact nature of the study) recorded the number of participants' death-related words (α = 1.00) and the total number of words that they used in their responses to the open-ended salience questions (α = 1.00). The coders also independently rated participants' open-ended responses on the following four dimensions by using a 6-

point Likert scale, ranging from 0 = *not at all* to 5 = *very much*: a focus on death or survival themes (α = 1.00), negativity expressed (α = 0.99), degree of threat expressed (α = 1.00) and degree of shallow or deep writing in the open-ended responses(α = 0.99). The coders' ratings on each dimension were then compared and their individual Likert scale responses for each item were subsequently averaged to form a single set of scores on each dimension as there were high levels of agreement between their independent sets of scores. As per Arndt et al.'s (2007) method, separate ANOVAs were conducted on each of these dimensions, except in the cases of the negativity and threat dimensions, where an ANOVA was conducted on an averaged threat-negativity dimension, as these two measures were very highly correlated (r = 0.86).

Separate ANOVAs on the number of death-related words and focus on death or survival themes both revealed violations of Levene's Test of Equality of Error Variances. As a consequence, these ANOVAs were conducted at a reduced alpha level of 0.025, rather than the conventional 0.05 level, as per Tabachnick & Fidell's (2001) recommendations. Even with such reduced alpha levels, both of these analyses revealed highly significant main effects of salience condition. Respectively, these main effects were; F (2, 75) = 12.30, $p < 0.001$, $\eta^2 = 0.25$ and F (2, 75) = 81.47, $p < 0.001$, $\eta^2 = 0.68$. Post-hoc tests revealed that there was no significant difference between participants' responses towards the Heart Attack Salience task (M = 2.50, SD = 2.21) or Mortality Salience task (M = 2.46, SD = 2.37) on their number of death-related words but that there were significant differences on this dimension between participants from the Heart Attack Salience and Control conditions (M = 0.23, SD = 0.43) and that there were significant differences on this dimension between participants from the Mortality Salience and Control conditions. Similarly, there was no significant difference between participants' responses towards the Heart Attack Salience task (M = 3.17, SD = 1.05) or the Mortality Salience task (M = 3.00, SD = 1.09) with respect to their focus on death or survival themes but there were significant differences on this dimension between participants' responses in the Heart Attack Salience and the Control conditions (M = 0.19, SD = 0.63) and between participants' responses in the Mortality Salience and Control conditions

With respect to the combined threat-negativity dimension, an ANOVA revealed a main effect of salience condition: $F(2, 75) = 14.20$, $p < 0.001$, $\eta^2 = 0.27$. Post-hoc analyses on this dimension revealed significant differences between each of the conditions. While participants from the Heart Attack Salience condition ($M = 3.25$, $SD = 0.85$) experienced significantly more threat-negativity than either the Control participants ($M = 2.56$, $SD = 1.07$) or the Mortality Salience participants ($M = 1.75$, $SD = 1.11$) with respect to the open-ended questions, a particularly interesting finding was that participants from the Control condition experienced significantly more threat-negativity than participants from the Mortality Salience condition.

Finally, while there was no significant main effect of salience condition for the total word count in participants' responses [$F(2, 75) = 1.91$, $p > 0.05$, $\eta^2 = 0.11$], there was a significant main effect of salience condition for the degree of shallow or deep writing in participants' responses [$F(2, 75) = 4.70$, $p < 0.05$, $\eta^2 = 0.05$]. With respect to the latter finding, there were no significant differences between the responses of participants from the Heart Attack Salience condition ($M = 2.19$, $SD = 0.85$) and those participants from either the Control condition ($M = 1.63$, $SD = 1.04$) or Mortality Salience condition ($M = 2.44$, $SD = 1.02$). However, the results did indicate that participants from the Mortality Salience condition displayed significantly deeper writing than participants from the Control condition.

3.3 DISCUSSION

The central hypotheses pertaining to this study were rejected due to a lack of significant differences between the experimental conditions on the main dependent variables. Firstly, the pattern of non-significant differences with respect to participants' behavioural intentions and commitments to use the CVD Risk Biochip led to a rejection of the hypothesis that participants would be less likely to express intentions to use the CVD Risk Biochip after they were asked to think about having a heart attack or their own mortality and subsequently given a distraction task to complete compared to control participants who did not have mortality or heart attacks made salient to them. Similarly, the absence of significant differences between the conditions on participants' attitudes towards the CVD Risk Biochip led to a rejection of the hypothesis that participants would exhibit less favourable appraisals of the

device after they were asked to think about having a heart attack or their own mortality and were subsequently distracted relative to control participants. As a side note, the finding that there was no significant impact of gender among participants from this cohort is consistent with some health psychology literature that demonstrates a moderating effect of gender differences in health behaviour patterns with older adults (e.g. Stoller & Pollow, 1994; Liang et al., 1999).

3.3.1 Possible Explanations for the Rejection of the Experimental Hypotheses

There are a number of possible explanations for the lack of significant differences between participants who were primed to think about their death or having a heart attack and participants who were primed to think about the death-neutral control topic of dental pain with respect to their attitudes towards the CVD Risk Biochip, behavioural intentions towards the device and commitment to use it in the future.

One explanation for these sets of results is that the CVD Risk Biochip does not contain enough implicit death reminders to create the potential for existential anxiety. Following this line of thought, if a device of this kind does not inherently contain reminders of mortality, one could argue that the distal defences involving the defensive avoidance of behaviours with the potential to detect fatal illnesses that were found in other TMT studies (e.g. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) do not necessarily apply to the CVD Risk Biochip. However, such an idea does not appear to be a sufficient explanation for a number of reasons. Firstly, this explanation does not intuitively make sense, as CVD has an extremely high mortality rate and there is widely published information in relation to this, including extensive media campaigns in Ireland that has involved the dissemination of CVD risk information booklets to schools and workplaces and the broadcasting of information about CVD risk on the radio and television (e.g. Irish Heart Foundation, 2011; Irish Heart Foundation, 2012). It logically follows that CVD should be associated with thoughts concerning death. This would also mean that priming thoughts relating to CVD and the CVD Risk Biochip should increase thoughts about death through a spreading activation of this association between CVD and death, following prior TMT research with respect to the spreading activation of death-related thoughts (e.g. Arndt et al., 2002; Arndt et al., 2007). Additionally, this explanation goes against the findings of previous research on the topic of defensive

avoidance with respect to behaviours associated with life-threatening conditions. For instance, this explanation runs contrary to findings from the analogous TMT research programmes (Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009), who found that explicit mortality reminders prompted an increase in defensively avoidant responses towards cancer-screening behaviours. There is also much evidence from the health psychology literature to suggest that people often try to deny and avoid potential risk information concerning CVDs (e.g. Cameron & Leventhal, 1995; Luce & Kahn, 1999; Emslie et al., 2001; O'Carroll et al., 2001; Kahn & Luce, 2003; Van Steenkiste et al., 2004; Brett et al., 2005; Caldwell et al., 2007).

Another more fundamental reason why the explanation that the CVD Risk Biochip does not have the potential to elicit existential anxiety does not make sense relates to the CVD Risk Biochip Information Sheet that was presented to participants in this study. Upon further examination of this sheet, it would appear that it contained several impersonal mortality reminders. An example of such a reminder was the introductory paragraph relating to CVD itself, which indicated that such diseases "cause more deaths globally each year than any other disease (approximately 30% of all deaths)". Other details on the sheet that could be seen to contain mortality reminders are the references to how the device works by measuring several proteins in the blood and the suggestion that it is necessary to take a small pinprick of blood from someone in order to use the device. These references to blood and physical body composition could be seen to draw attention to the more creaturely aspects of being human. Emphasising creaturely aspects of human existence in this way has been found in certain strands of TMT literature to produce the same sorts of responses as other types of mortality reminders (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Cox et al., 2007; Goldenberg et al., 2008). As stated earlier, both Becker (1973) and Goldenberg (2005) have given a thorough account of why this effect occurs by demonstrating how awareness of the human body can remind humans of their physicality, similarity to other animals and vulnerability to death and decay. Following such ideas, it is unlikely that the above explanation adequately accounts for the results because there would appear to be several mortality reminders present in the information presented to participants.

Another possible explanation for the absence of any significant moderating effect of unconscious existential anxiety on attitudes, behavioural intentions and behavioural commitments towards the CVD Risk Biochip is that the sorts of implicit mortality reminders in the CVD Risk Biochip Information Sheet that are detailed above could have elicited a proximal defensive reaction in participants. As described in Chapter 2 (pages 1-23 - 1-24), proximal defences in TMT typically consist of rationalising threat-focused methods that serve to remove death-related thoughts from the focus of attention such as cognitive distortions that serve to deny one's vulnerability to mortality reminders or health-promoting promises that contiguously deal with mortality concerns by sublimating them (as per Pyszczynski et al., 2000). With regards to the current study, one could argue that participants used the availability of the CVD Risk Biochip as a means to distract themselves from their vulnerability to the potential risk of obtaining a diagnosis of CVD after reading the general information about CVD-related deaths and the references to blood and physical body composition in the CVD Risk Biochip Information Sheet. This explanation arises from the facts that 1) the CVD Risk Biochip Information Sheet, which potentially contained mortality reminders, was presented to participants after the distraction task had already been presented to them and 2) the behavioural intentions and attitudes questions were presented to participants immediately after they had read this information sheet. That is to say, the completion of attitude and behavioural intentions items immediately after having received a passage to read which contained potential mortality reminders may have meant that these mortality reminders were still consciously present for participants when they answered the aforementioned items.

Although there is mild support for this alternative explanation for the non-significant results (i.e. the negatively skewed attitude and behavioural intention results across all conditions that were found in this study suggests that all participants reacted positively towards the device), it also does not appear to be plausible. First of all, it should be noted that negatively skewed results are often associated with attitude and behavioural intention scales in health-related research (e.g. Tabachnick & Fidell, 2001), so there is no reason to suggest that such a pattern of results in the current study were specifically related to the potential mortality reminders provided in the CVD Risk Biochip Information Sheet. This explanation also does not appear to make

sense as one would expect that conscious thoughts about participating in behaviours relating to the detection of a life-threatening disease would pose a potential threat to an individual's perceptions of good health following prior health psychology research (e.g. Millar & Millar, 1993; Millar & Millar, 1995; Millar, 2006; Caldwell et al., 2007). According to the first proposition of the TMHM (Goldenberg & Arndt, 2008), a proximal defence will be adopted in the face of conscious mortality reminders to the extent that this defensive strategy is effective in facilitating the removal of the mortality reminders from immediate conscious awareness. In the current scenario, the threat associated with thinking about using the CVD Risk Biochip would appear to offset any cognitive reduction in vulnerability associated with a proximal defensive reaction of positive attitudes and behavioural intentions towards the device, particularly since proximal defences are purported to be of a somewhat conscious and vulnerability-denying nature (e.g. Pyszczynski et al., 1999; Pyszczynski et al., 2000; Greenberg et al., 2000; Goldenberg & Arndt, 2008). In other words, agreeing to perform the health-oriented behaviour of using the CVD Risk Biochip does not appear to represent a defence against conscious mortality reminders. This is because an individual who is in a conscious mode of thought would not succeed in avoiding or denying mortality reminders by agreeing to perform this health-oriented behaviour which has the potential to provide life-threatening information. On the contrary, agreeing to perform such a health-oriented behaviour would appear to bring one closer to the possibility of receiving further conscious mortality reminders.

A final reason why this explanation does not appear to be credible relates to the nature of the potential mortality reminders in the CVD Risk Biochip Information Sheet. Specifically, these potential mortality reminders could be seen as relatively subtle and general reminders because they did not explicitly make the participants aware of their own personal potential risk of developing CVD. For instance, the information provided did not explicitly draw attention to each participant's inherent risk factor for developing CVD by being over the age of 55 but drew attention to the prevalence of CVD in a more general fashion. TMT research into distal defences has found that subtle reminders of mortality tend to produce distal defences in participants rather than proximal defences (e.g. Greenberg et al., 1994), even in the absence of a delay or distraction. As a result, the apparent subtlety of the mortality

reminders in the CVD Risk Biochip would appear to suggest that a proximal defensive reaction would not appear to be at work in this instance.

Following this latter argument that the subtle reminders of mortality that were present in the CVD Risk Biochip Information Sheet should have led to distal defences in participants, it could be argued that the negatively skewed behavioural intentions and attitude responses from participants resulted from a cultural worldview defensive reaction from participants from each of the conditions in this study towards such reminders. This alternative type of distal effect would consist of participants putting their faith in science and upholding the cultural worldviews of scientific progress, much like the processes described by Becker in the opening chapters of his posthumously published book "*Escape from Evil*" (1975). In this book, Becker suggests that modern Western man has transferred much of his faith that was previously in magic, religious or spiritual tradition into modern machines. Machines themselves can be interpreted as symbols that embody the very values of scientific measurement. In this way, Becker argues that we put our faith in symbols of science with the same sort of ritual trust that was previously associated with traditions linked with the non-material world:

> Besides our belief in the efficacy of machine control of nature has in itself elements of magic and ritual trust. Machines are supposed to work, and to work infallibly, since we have to put all our trust in them. And so when they fail to work our whole world view begins to crumble-just as the primitives' world view did when they found their rituals were not working in the face of western culture and weaponry. I am thinking of how anxious we are to find the exact cause of an airplane crash, or how eager we are to attribute the exact cause of the crash to "human error" and not to machine failure (p. 9, Becker, 1975).

This sort of distal defence has already been uncovered in some more recent TMT research, where it was found that existential reminders led to increased support for the cultural worldview of scientific progress among lay participants (e.g. Rutjens, Van der Pligt & Harreveld, 2009; Rutjens, Harreveld & Van der Pligt, 2010). In support of this sort of distal defence in the current study, one would have expected to find a negative skew in participants' attitude and behavioural intentions responses towards

the device if such a defence were to have been present. As previously stated though, negatively skewed data are often associated with attitude and behavioural intention scales in health-related research (e.g. Tabachnick & Fidell, 2001). Consequently, there is no evidence to suggest that these sorts of effects are specific to mortality reminders. Additionally, the subtle death reminders that were present in the CVD Risk Biochip information sheet did not represent particularly personal mortality reminders in the same way that the subtle reminders that were present in previous TMT research studies did (e.g., where participants were asked to think about the death of a relative or close friend in Study 1 of Greenberg et al., 1994). Instead, these mortality reminders were quite general and impersonal. Prior research from health psychology suggests that these sorts of general mortality reminders are often psychologically minimised by people (e.g. Croyle & Sande, 1988; Van Steenkiste et al., 2004; Peretti-Watel et al., 2007). Consequently, it is less likely that these sorts of mortality reminders would be particularly threatening to participants who read the CVD Risk Biochip Information sheet unless these participants had already been in the receipt of mortality reminders of a more personal nature (e.g. by having completed either the Heart Attack Salience task or the Mortality Salience task).

Another reason why the distal defensive reaction of supporting a scientific cultural worldview does not appear to have been likely among participants in the current study is the idea that defensive avoidance would logically seem to be a more effective distal defence. By way of explanation, the availability of a defensive avoidance reaction in the current study and the greater potential for such a reaction to circumvent the possibility of receiving an existentially threatening health status which could act as a significant blow to an individual's self-esteem (i.e. through removing the prospect that one might receive life-threatening information by avoiding the potential to acquire such information) would suggest that a defensive avoidance strategy may have been a more effective distal defence in this case. Indeed, as indicated previously, prior TMT research relating to cancer screening (i.e. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) found that participants were more likely to exhibit patterns of defensive avoidance towards the prospect of participating in behaviours with the potential of uncovering a life-threatening condition after receiving existential reminders that were either conscious or just below conscious awareness. In a related vein, Greenberg et al. (2000) demonstrated

that providing participants with subtle mortality reminders after an initial explicit mortality reminder and a subsequent distraction results in distal defences. These prior findings would lead one to have expected a distal defensive reaction of avoidance among participants in the current study rather than a pro-scientific bias. However, as evidenced by the lack of significant differences in participants' commitment to use the device following the potential mortality reminders in the CVD Risk Biochip Information Sheet and the relatively high number of participants who signed up to the study (50 in total), distal defensive avoidance does not appear to have taken place in the current study.

The pattern of non-significant differences towards the CVD Risk Biochip across the conditions could also be explained by the proposition that participants may not have found the device to be particularly relevant to their health. Following on from health psychology research on health threat minimisation (e.g. Eiser et al., 1979; Ditto et al., 1988; Avis et al., 1989; Croyle, 1990; Croyle et al., 1993; Croyle et al., 1997; de Hoog et al., 2007), people tend to downplay the seriousness of a health threat in order to deny their vulnerability to it, particularly if they are known to have a risk factor for developing the disease. Since participants in this study all had a naturally occurring risk factor for developing CVD (each participant being over the age of 55), one could argue in this way that there may have been no significant difference between the groups on the dependent variables because all participants downplayed the relevance of the device to their own health, irrespective of their condition. Nevertheless, this explanation does not appear to be entirely plausible as, if it were true, one would expect all of the participants' evaluations of the device to be positively skewed rather than the negative skew that was present in their responses. Furthermore, such an explanation would seem to imply that participants were explicitly aware of their inherent risk factor for developing CVD. However, it is unlikely that participants were explicitly aware of such a risk factor while answering the attitude and behavioural intention questions as the CVD Risk Biochip information sheet made no reference to such a risk factor. In contrast, the above listed studies from the health threat minimisation literature all made their participants explicitly aware of having a risk factor for an illness or health deficiency.

A final potential explanation for the lack of significant differences between the groups on behavioural intentions and attitudes towards the CVD Risk Biochip relates to the age of the participants in the study. As previously noted, participants were only eligible to take part in this study if they were over the age of 55; a recruitment strategy that had been designed so that participants were more likely to find the CVD Risk Biochip to be of relevance to their health (i.e. since being over the age of 55 constitutes a naturally occurring risk factor for developing CVD). However, it is possible that this cohort of participants did not demonstrate any significant differences in their attitudes, behavioural intentions or commitments to use the device on the basis of receiving a Mortality Salience task because of an attenuating effect of existential anxiety with advancing age. This explanation also has the advantage of accounting for the similar patterns of non-significance for those participants who were asked to think about having a heart attack. In this regard, one older lady who participated in this study spontaneously referred the current research study to her own experiences of existential anxiety at different periods of her life after she had been fully debriefed as to the nature of the current study. This lady indicated that the death of her mother from cancer when she was in her 50s had made her experience a high level of anxiety in relation to her potential genetic risk for developing cancer later in life. In contrast to this period of conscious existential anxiety, she explained that in more recent years her fears of death had diminished as a result of the fact that she had subsequently confronted the deaths of many of her close friends and relatives.

In this way, older participants such as those from the current study, may be more accustomed to thinking about death and may subsequently experience less existential anxiety towards thoughts about death or having a heart attack. Although there are limited TMT studies involving older samples of participants such as the current study, these studies have tended to support the suggestion that there is a moderating effect of existential anxiety with increases in age (e.g. Cicirelli, 2002; Maxfield et al., 2007). There are several potential explanations for such a moderating effect of existential anxiety with advancing age. Firstly, there is the possibility that the frailty of the processes of refusing to consciously face one's own mortality or denying one's death becomes ever more apparent as one grows older. Although most people acknowledge the inevitability of their own death, they normally consider it to be a remote future event with little relevance to their present circumstance (Tomer, 1994). However, as

an individual gets older and experiences the deaths of more and more relatives and close friends, the remoteness and abstract possibility of death begins to diminish, while a conscious awareness of the concrete possibilities of one's own death becomes increasingly difficult to avoid. This inherent difficulty for older adults to avoid the possibility of their own demise is further compounded by the increasing prevalence of reminders of mortality from their own bodies (e.g. visible signs of aging and faltering bodily functions). The increase in the availability of specific death-related thoughts that might accompany this landscape of mounting mortality reminders might somewhat diminish the anxiety-arousing potential of such reminders (Thorson & Powell, 1988), in a similar fashion to the way that extended periods of forced exposure to a frightening stimulus can serve to diminish their capacity to frighten an individual in the behavioural therapy known as "flooding". This sort of habituation towards the subject of death may lead to a moderating effect of existential anxiety in older adults' responses towards Mortality Salience and Heart Attack Salience.

Another explanation for the potential attenuating effect of death anxiety in older adults is that this cohort may have had a greater amount of time and opportunity to provide for their own personal accounts of the meaning of existence. As Jean-Paul Sartre (1956) proposed in his famous essay "*Being and nothingness*", reflection on death for most people equates to a reflection on the potential meaninglessness of existence. In order to oppose such meaninglessness, we often yearn and search for a certain amount of symbolic meaning and purpose for our existence throughout much of our adult life. Indeed, Becker (1973; 1975) suggested that a large part of an individual's adult life concerns a search for symbolic meaning to existence through the adoption of what he called a "*causa sui project*". This *causa sui project* involves an active participation in any activities that allow oneself to be represented as a meaningful contributor to one's symbolic social or cultural world. For instance, a doctor might affirm symbolic meaning for her existence through the processes of helping others in her social world through her medical practice. Elsewhere, Erik Erikson (e.g. Erikson, Erikson & Kivnick, 1986; Erikson & Erikson, 1997) put forward a similar idea when he suggested that the middle stage of adult life represents a developmental challenge of "Generativity vs. Stagnation", where an individual is often involved in tasks which involve the perpetuation of culture through their profession and transmission of cultural values to their offspring. If the individual is

successful in these tasks, by the time they reach the next developmental challenge of "Integrity vs. Despair" in old age, Erikson argues that they will have become content at having reached a deeper sense of meaning and purpose to their existence. Similarly, Thorson & Powell (1988) have suggested that attenuating age-related effects on death anxiety could arise from older adults having resolved mortality fears as a result of greater opportunities to review their life histories.

Erikson also proposed that the final years of life, represented by the challenge of "Integrity vs. Despair", involve a certain amount of withdrawal from our daily ritual engagements in order to achieve "transcendence". Such a withdrawal has the potential for the individual to lose the sense of belonging that they may have experienced in the previous stage of "Generativity vs. Stagnation". However, if the individual has achieved a sense of meaning and purpose for their lives through a successful completion of this latter stage, they tend to achieve "transcendence" at the stage of "Integrity vs. Despair". Importantly, this idea of "transcendence" does not necessarily represent a religious dimension but a sense of positioning the self in a broader and more meaningful context (e.g. as an important cultural contributor); a positioning of the self that may reach beyond the linear confines of our typical relationship with the concept of time. This process of transcendence in older adults has been termed *gerotranscendence* by the social gerontologist Lars Tornstam (1994), who describes it as "…a shift in meta-perspective, from a materialistic and rational vision to a more cosmic and transcendent one, normally followed by an increase in life satisfaction" (p. 203).

Tornstam, like Erikson before him, suggested that the process of life review in older adults is a means to achieve a sense of this "gerotranscendence" by evaluating whether or not one has led a meaningful life. Even Becker (1975) viewed the process of transcendence as the final way that the individual ultimately resolves the problem of mortality, or the ultimate way of "denying death" by finding a sense of faith in the meaning of one's own existence; "Man transcends death…especially by finding a meaning for his life, some kind of larger scheme into which he fits" (p. 3, Becker, 1975). Or, as Erikson puts it: "At the end of life, we may find that some rudimentary hope has blossomed into a mature faith in being that is closely related to essential wisdom" (p. 218, Erikson et al., 1986).

To conclude, it would appear that a possible explanation for the lack of significant differences between the groups on any of the dependent variables in the current study was that there was a diminished effect of existential anxiety among older participants in this study who may have achieved a sense of "gerotranscendence". This diminished effect of existential anxiety among such participants would mean that they failed to exhibit differences from a baseline level in their attitudes towards the CVD Risk Biochip, behavioural intentions towards the device and commitment to use the device in a proposed pilot study as a result of receiving either a Mortality Salience or a Heart Attack Salience task. These participants may have also exhibited positive appraisals towards the device due to a growing interest in health-related concerns characteristic of their age cohort (e.g. as per Stoller & Pollow, 1994; Apostolidis et al., 2009); an explanation which finds partial support in the results of the content analyses of participants' open-ended responses to the salience measure, which are examined below.

3.3.2 Content Analyses of the Salience Measure

The findings from the content analyses of the salience measure task suggest that Heart Attack Salience was just as likely to elicit thoughts concerning death as Mortality Salience. This is because both the participants who received a Heart Attack Salience task and the participants who received a Mortality Salience task produced a significantly greater number of death-related words and focused on significantly more death and survival themes than participants who received a Control task, but there were no significant differences on these dimensions between the responses of participants who received the Heart Attack Salience task and those who received the Mortality Salience task. This finding is slightly different to Arndt et al.'s (2007) finding that participants elicited a significantly greater number of death-related words and focused on significantly more death and survival themes in their responses towards Cancer Salience compared to participants who received a Mortality Salience task. Nevertheless, these results demonstrate that the Heart Attack Salience measure appears to have primed thoughts of death to the same degree as the Mortality Salience measure. Consequently, the results suggest that the Heart Attack Salience measure can be considered as a valid measure for priming thoughts concerning death in participants. In this way, receipt of a Heart Attack Salience task and a subsequent distraction should have led to distal defences in participants following the logic of

TMT (e.g. Greenberg et al., 1994; Pyszczynski et al., 1999; Pyszczynski et al., 2000; Arndt, et al., 2007).

The findings that participants who completed the Heart Attack Salience task and the Control task both tended to experience significantly greater feelings of negativity and threat in comparison to participants who completed the Mortality Salience task is also interesting as it would appear to suggest that thinking about more concrete health-related concerns (i.e. heart attacks and dental problems) may be more threatening to older adults than thinking about the more abstract concept of death itself. This may relate to the finding from the health psychology literature that older adults display increasing concerns about their health status (e.g. Stoller & Pollow, 1994; Apostolidis et al., 2009). In other words, while older adults may not find death itself to be particularly threatening, they may find health concerns that impede their current quality of life to be threatening. In this respect, dental pain may represent a more tangible negative threat to older adults than death itself as older adults are more likely to have direct experience with this sort of pain and may see this sort of pain as a barrier to their quality of life. However, as older adults are also likely to know friends or relatives who have experienced life-impeding effects of heart attacks, they may consider heart attacks to represent a more negative threat than both dental pain and the abstract concept of death itself; the latter of which may always be perceived as an end-point to embodied existence rather than a prolonged suffering through health concerns. Although these ideas would need to be tested empirically in order to establish their validity and reliability, they appear to already have some correspondence with health psychology research that has found that adults display increasing concerns about their health status as they get older (e.g. Stoller & Pollow, 1994; Apostolidis et al., 2009).

Finally, the finding that only the Mortality Salience task elicited deeper writing among participants suggests that thinking about death in an abstract fashion may lead older adults to adopt a more thoughtful or philosophical state of mind compared to thinking about health concerns such as dental pain or heart attacks. Indeed, it is worth noting in this respect that older adults from the Mortality Salience condition were more likely to refer to philosophical, worldview or spiritual ideas in their open-ended answers than older adults from either the Heart Attack Salience condition or the

Control condition. One participant suggested that “My spirit will leave the body and I hope to go to somewhere beautiful” when they were asked to think about their own personal death. Several other participants also mentioned the possibility that their soul or spirit would “leave their bodies” when they died and that this soul or spirit would then proceed to ascend to heaven or somewhere where they would meet loved ones that had already departed. In contrast, some other participants gave a staunch atheistic account of what would happen to them when they died. For instance, one participant suggested that “Once dead, that is a finality for me as a being. I have no beliefs in any form of afterlife, and as a biologist have that as an absolute certainty”. Others responded with a slightly more philosophical approach to the question of what would happen to them when they physically died, with one participant noting that the following would occur; “Cessation of being of which one may or may not be aware depending on the nature of the event.”

These responses of participants are interesting when one considers the previously mentioned finding that these adults tended to consider death to represent a less negative threat than either heart attacks or dental pain. Taking these two findings together, it is possible that representing death in a more spiritual or philosophical fashion may help older adults to moderate the looming threat of death itself. This idea is supported by much TMT research that has found that philosophical and spiritual explorations of meaning can help people to moderate their experience of existential anxiety (e.g. Dunkel, 2002; Pyszczynski et al., 2003). Additionally, this idea appears to correspond with the previously mentioned literature that suggests that death anxiety decreases while spirituality or philosophical enrichment of life increases as an adult grows older (e.g. Erikson et al., 1986; Thorson & Powell, 1988; Tornstam, 1994; Erikson & Erikson, 1997). In sum, it appears that older adults represent death in a deeper fashion, which may account for their seemingly lower experiences of death anxiety.

Chapter 4: Study 2

Following the potential explanation that the results of the first study occurred due to a diminished effect of existential anxiety with older participants and the partial evidence for a degree of "gerotranscendence" in participants' open-ended responses towards the Mortality Salience task, an investigation into the health psychology literature pertaining to the relationship between age and anxieties related to death was conducted. It was deemed necessary to explore whether or not previous research into death-related anxiety had uncovered the age-related differences in death anxiety that were partially suggested by the results of the first study. This was because it was reasoned that an examination of this literature might shed light upon whether or not a younger age cohort would be more prone to the effects of defensive avoidance towards the CVD Risk Biochip arising from existential anxiety in preparation for a second study in the research programme.

4.0.1 Experiences of Death Anxiety in Older Adults in Context

The relationship between death anxiety and age has been examined in the health psychology literature for over forty years. Although many early studies in this area failed to find a significant relationship between death anxiety and age (e.g. Templer, Ruff & Franks, 1971; Viney, 1984; Vargo & Black, 1984; Wagner & Lorion, 1984), these studies tended to either treat the standard Templer Death Anxiety Scale (Templer, 1970) as a single construct or used less robust scales of measurement (Fortner & Neimeyer, 1999). However, with the advent of an adjustment to Templer's scale by Thorson & Powell (1994), the study of death anxiety shifted towards the recognition that it is a multi-dimensional construct. For instance, DePaola, Neimeyer, Griffin & Young (2003) found in their study that older respondents were less concerned with death preventing them from completing many of their life goals and they argued that this may be because older adults have already accomplished these goals. Since then, literature in this area has tended to demonstrate a significant decline in death anxiety from mid-life to old age (see the extensive reviews of this literature by Neimeyer & Van Brunt, 1995; Fortner & Neimeyer, 1999; Neimeyer, Wittkowski & Moser, 2004). In particular, research in this area has demonstrated that by age 60, death anxiety for both men and women tends to stabilise at a uniformly

low level (Russac, Gatliff, Reece & Spottswood, 2007). The bulk of this research also suggests that older adults are more consciously aware of death and less frightened of conscious death reminders due to their increasingly frequent encounters with them. For instance, De Raedt & van Der Speeten (2008) found that young and middle-aged adults took longer to process death-related words compared to older adults.

More recently, TMT studies have begun to examine the moderating effects of death anxiety with increases in age. For instance, Maxfield et al. (2007) found that, in contrast to younger adults who tend to demonstrate harsher judgment patterns after Mortality Salience, older adults tended to evaluate moral transgressors in significantly more lenient ways after they had been provided with subtle mortality reminders. Elsewhere, Cicirelli (2002) suggested that older adults tend to have a willingness to accept death and deal with mortality at a proximal level of defence, presumably because they have had greater opportunities to deal with the prospect of their own demise. In line with this idea, he found that older adults were more willing to engage with thoughts of death at a conscious level when they had high religiosity, high social support and a more internal locus of control.

With a more health-related slant, Taubman - Ben-Ari & Findler (2005) have highlighted the fact that there may be age-related differences in proximal and distal defensive reactions towards health-promoting behaviours. In their research, they found that proximal defences make younger and middle-aged adults more willing to engage in health-promoting behaviours but that older adults are less inclined to express intentions to change their health behaviours when mortality concerns are conscious. In relation to distal defences, Taubman - Ben-Ari & Findler (2005) also found that younger adults and older adults with high self-esteem do not express a willingness to change their health behaviours after their mortality has been made salient but that middle-aged adults and older adults with lower self-esteem do express a willingness to change their health behaviours under analogous conditions. The authors suggested that these complex findings represented more symbolic reactions on behalf of the participants towards mortality concerns at an unconscious level and that these reactions differed due to age-related differences in the perceived level of threat of mortality concerns. They argued that young adults may not be concerned with changing health behaviours that are aimed at preserving life as they may not

consider these health behaviours to be particularly relevant to them. In contrast, they suggested that middle-aged adults might be more greatly concerned with their health and may want to ensure that their health is sufficiently maintained. They also argued that older adults who have come to terms with the idea of their own death (represented by those participants with higher levels of self-esteem) may no longer be terrified by it and therefore these adults may be less concerned with efforts to increase their lifespan through the adoption of health behaviours. In contrast, they suggested that older adults who have not come to terms with their death (represented by those participants with lower levels of self-esteem) may be motivated to increase their lifespan by engaging in a greater number of health behaviours.

The above research supports the explanation that the non-significant results of the first study in the current programme may have arisen from a diminished effect of existential anxiety among the older adults. This is because these adults may have already dealt with the possibility of their own demise through representing their selves in a more transcendental fashion (e.g. Erikson et al., 1986; Thorson & Powell, 1988; Tornstam, 1994; Erikson & Erikson, 1997). In contrast, middle-aged adults appear to be at greater risk of exhibiting patterns of defensive avoidance towards behaviours such as using the CVD Risk Biochip due to their greater experience of death anxiety (e.g. Neimeyer & Van Brunt, 1995; Fortner & Neimeyer, 1999; Neimeyer et al., 2004). Becker (1973) himself suggested that this period represents the point where an individual is most saddled with existential anxiety as they struggle to achieve symbolic meaning to their existence through their *causa sui* project. Indeed, the middle adulthood stage of "Generativity vs. Stagnation" has even been proposed to represent the period of an individual's life that involves the most active attempts to meaningfully contribute to their social and cultural world (e.g. Erikson et al., 1986; Erikson & Erikson, 1997). Following such ideas, middle aged adults may be particularly vulnerable to the defensive avoidance of disease detection behaviours (such as using the CVD Risk Biochip) following mortality reminders due to their seemingly greater experience of the effects of existential anxiety. Additionally, the potential existential threats to middle-aged adults' health status and corresponding threats to their self-esteem posed by the prospect of receiving negative health-related information concerning CVD would appear to make defensive avoidance a likely behavioural strategy for such a cohort (e.g. following proposition two of the TMHM;

Goldenberg & Arndt, 2008). In light of such propositions, it was decided to conduct a second study with a middle-aged cohort of adult participants using the same experimental questionnaire and design as the first study in order to examine whether or not unconscious mortality reminders would lead them to exhibit greater patterns of defensive avoidance towards the CVD Risk Biochip in this way.

4.0.2 The Current Study

This study focused on participants aged 40-55 years of age in order to investigate whether or not unconscious existential anxiety would act as a barrier to their potential uptake of the CVD Risk Biochip and their accompanying attitudes towards the device. However, it was reasoned that a middle-aged cohort of participants may have found CVD less relevant to their health (as per Jemmott et al., 1986). Consequently, it was considered important to include an indication of middle-aged risk in the development of CVD in the Questionnaire Booklets for this study. In order to accomplish this, an additional paragraph was added to the CVD Risk Biochip Information Sheet. This paragraph explicitly outlined middle-aged risk in the development of CVD before participants completed the measures pertaining to their attitudes, behavioural intentions and commitments to use the CVD Risk Biochip. This paragraph was based on the results of a study by Lloyd-Jones, Dyer, Wang, Daviglus & Greenland (2007); a highly cited research study with a sample size of 14,526 men and women, which found that even the presence of a single risk factor for CVD in middle-age was associated with a substantial increase in an individual's lifetime risk for death from CVD and a shorter survival from the disease.

Following these minor alterations to the design and materials, the predictions for Study 2 were analogous to those of Study 1. Specifically, it was predicted that participants aged 40-55 years of age would display less favourable attitudes towards the CVD Risk Biochip and would be less likely to express intentions to use the device or commitments to use the device after they were reminded of their mortality and were subsequently distracted compared to control participants who were not reminded of their mortality. Additionally, in line with the predictions of the first study, it was predicted that participants in the second study would exhibit less favourable attitudes towards the CVD Risk Biochip and would be less likely to express intentions to use it

after they were asked to think about having a heart attack and were subsequently distracted compared to control participants.

4.1 METHOD

4.1.1 Design and Participants

The design of this study was based on Study 1; thereby incorporating a three group independent measures design as a function of the salience questionnaire that participants received. Block randomisation was used in order to randomly assign participants to the Control condition, the Mortality Salience condition or the Heart Attack Salience condition respectively. Seventy-eight participants aged 40-55 volunteered to participate (42 males and 36 females). As with Study 1, this sample size was sought in order to obtain sufficient statistical power of 0.80 (as per the tables provided by Cohen, 1992) in preparation for a three group MANCOVA design with two dependent variables. Recruitment was carried out by a snowball sampling method, where networks of the researcher disseminated information leaflets to potential participants (See Appendix H1 for a Sample Information Leaflet) and advised them to contact the researcher if they were interested in participating in the study once they had the opportunity to consider the information contained in the leaflet. The researcher subsequently arranged a suitable time and convenient location for those participants who indicated an interest in participating in the study in order for them to complete a Questionnaire Booklet. As with the first study, participants completed the questionnaire in their own homes when a controlled environment was not readily available. These participants were supervised to ensure that they were not distracted and to confirm that the questionnaire was completed in the order presented. Additionally, as with the first study, all participants had to confirm that they had never experienced a significant negative heart-related event (e.g. a heart attack) on the Consent Form (See Appendix B2) they were given to sign before they were deemed eligible to take part.

4.1.2 Procedure and Materials

The procedure was almost identical to the procedure for Study 1 (see pages 1-58 – 1-59). As before, each participant was initially given a Plain Language Statement and Consent Form to complete (See Appendix B2) before completing one of three

Questionnaire Booklets (See Appendix D1-D3). Each Questionnaire Booklet consisted of either the control measure or one of the salience measures, a distraction task, the CVD Risk Biochip Information Sheet, the CVD Risk Biochip Attitude Scale, the CVD Risk Biochip Behavioural Intentions Scale and the De Facto Intentions Measure. There was one minor alteration to the materials, which constituted the inclusion of an additional paragraph in the CVD Risk Biochip Information Sheet in the new Questionnaire Booklets. As described above, this additional paragraph was derived from the results of a study by Lloyd-Jones et al. (2007) and contained the following information in order to ensure that the participants considered CVD to be relevant to their health:

> Recent research has demonstrated that high risk for developing Cardiovascular Disease begins in middle-age. In particular, this research has shown that people with just one risk factor for Cardiovascular Disease in middle age have a strong chance of developing the disease in later life. Furthermore, such people have a much higher risk of death from Cardiovascular Disease and a shorter estimated survival time for the disease.

4.1.3 Ethical Issues

Study 2 was characterised by many of the same ethical considerations that had been previously encountered in Study 1 (e.g. deception, priming thoughts of death and priming thought of having a heart attack). These considerations were dealt with in the same manner in which they had been dealt with in the first study. However, a novel ethical concern arose in the second study in view of the fact that participants were given the amended CVD Risk Biochip Information Sheet containing an indication of middle-aged risk for the development of CVD. This new passage could be seen to have contained a mild risk for participants as it could have triggered unpleasant feelings of vulnerability and phobic responses towards developing CVD. Nonetheless, this type of information was not considered to constitute a risk to participants that departed from normal everyday experiences. This is because risks for developing CVD and similar heart-related illnesses are frequently reported in media that is in the public domain such as newspapers, magazines and documentaries. Following submission of an ethics application, the DCU Research Ethics Committee granted Ethical Approval for the study.

4.1.4 Data Analyses

In a similar fashion to Study 1, a MANCOVA was planned for the attitudes and behavioural intentions data with gender as a covariate and a logistic regression was planned for the data pertaining to the De Facto Intentions Measure. MANCOVA was chosen for the former sets of data in order to investigate if there were differences in middle-aged participants' attitudes and behavioural intentions towards the CVD Risk Biochip as a function of receiving a Mortality Salience, Heart Attack Salience or Control task and being subsequently distracted. As per Study 1, a three-group MANCOVA was deemed appropriate with two potentially high-threat conditions and a neutral condition in spite of the possibility of a Type II error because a) Heart Attack Salience is a novel measure for priming existential threat that had only previously been used in the first study of the current programme where no significant differences had been uncovered between the Heart Attack Salience and control groups on the main dependent variables (i.e. this measure could not be clearly assumed to represent either a high, medium or low-threat condition) and b) the alternative possibility of conducting two separate MANCOVAs between each of the respective high threat groups and the control group would have increased the probability of statistically capitalising on chance, thereby increasing the probability of committing a more serious Type I error. Once again, gender was included as a covariate to control for the possibility that participants' positive or negative appraisals of the CVD Risk Biochip were the result of gender differences in health-oriented behaviours (as per Tamres et al., 2002; Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004; Lynn et al., 2009). Logistic regression was chosen for the latter data set in order to assess if a participant's gender or assignment to one of the three experimental groups would help to predict the odds of whether or not they chose to sign up for the proposed CVD Risk Biochip pilot study.

4.2 RESULTS

4.2.1 Sample Characteristics

Participants between the age of 40-55 were recruited (M = 49, SD = 3.53; with 10 missing values). The sample consisted of 42 males (53.8%) and 36 females (46.2%).

4.2.2 Descriptive Statistics

As with Study 1, all items from the attitudes and behavioural intentions scales that were negatively phrased had their scores reversed so that all of the values reflected the same directionality (i.e. each participants' score on a particular item now represented a score on a 5-point Likert scale, from 1 = highly negative to 5 = highly positive). Descriptive statistics for the re-scored items in the CVD Risk Biochip Attitude Scale and CVD Risk Biochip Behavioural Intentions Scale are given in Table 4.1 and Table 4.2 respectively.

	Mortality Salience		*Heart Attack Salience*		*Control*		*Total*	
Item	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. The CVD Risk Biochip is an exciting new device.	4.50	0.65	4.42	0.76	4.46	0.58	4.46	0.66
2. Diagnostic testing should be left to the professionals.	2.42	1.21	2.85	1.16	2.73	1.51	2.67	1.30
3. The CVD Risk Biochip makes me feel empowered about my health.	3.92	0.74	3.92	1.06	3.81	0.90	3.88	0.90
4. The CVD Risk Biochip will only serve to frighten people about their health.	4.12	0.65	3.77	1.21	3.50	0.99	3.79	1.00
5. The CVD Risk Biochip is a valuable new device.	4.54	0.51	4.35	1.02	4.50	0.58	4.46	0.73
6. Moving diagnostic testing from hospital settings to the home is a great idea.	3.92	0.74	3.85	1.19	3.77	1.11	3.85	1.02
7. The CVD Risk Biochip makes me feel anxious.	4.19	0.90	4.19	0.98	4.00	1.23	4.13	1.04
8. The CVD Risk Biochip will encourage people to take a more active approach to their health.	4.08	0.98	4.08	0.98	4.08	0.85	4.08	0.92
9. The CVD Risk Biochip is an unnecessary device.	4.50	0.58	4.38	0.85	4.38	0.75	4.42	0.73

Table 4.1: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Attitude Scale by Condition (Re-scored Values)

	Mortality Salience		*Heart Attack Salience*		*Control*		*Total*	
Item	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.	3.46	1.03	3.62	1.36	3.38	1.13	3.49	1.17
2. If my GP recommended that I use this device, it is highly likely that I would use it.	4.50	0.51	4.77	0.43	4.73	0.45	4.67	0.47
3. The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.	3.65	1.06	3.85	1.26	3.62	1.24	3.71	1.18
4. At this moment, I feel particularly motivated to use the CVD Risk Biochip.	3.35	1.29	3.27	1.46	3.23	1.24	3.28	1.32
5. At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.	4.04	0.82	3.85	1.22	3.92	1.09	3.94	1.05
6. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.	3.96	0.92	4.08	1.13	4.23	1.07	4.09	1.03

Table 4.2: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Behavioural Intentions Scale by Condition (Re-scored Values)

4.2.3 Principal Component Analysis

The questionnaire data for the second study did not fit a Confirmatory Factor Analysis (CFA) model for either scale based on the results of the PCA from the first study. This lack of model fit may have arisen due to characteristic differences between the sample cohorts in the first and second study. More specifically, the sample in the second study potentially represented a group of participants who were conceptually distinct from participants in the first study with regard to their experience of death anxiety due to their age (as per the literature concerning the relationship between death anxiety and age; e.g. Neimeyer & Van Brunt, 1995; Fortner & Neimeyer, 1999; Neimeyer et al., 2004). Consequently, it may have been inappropriate to predict theoretical relationships among observed and unobserved variables in a CFA due to this potential theoretical distinction between the samples of the two studies. In light of this and because of the fact that the principal purpose of this analysis was data reduction, PCA was performed on both the CVD Risk Biochip Attitude Scale and the CVD Risk Biochip Behavioural Intentions Scale in the same manner as the first study.

As with the first study, a central aim of the analyses was to find a single construct to represent attitudes towards the CVD Risk Biochip and behavioural intentions towards the use of the CVD Risk Biochip respectively. Following the logic of the first study, it was also considered important for each of these constructs to contain both positively phrased items and negatively phrased items in order to control for acquiescence response set answers (as per Winkler et al., 1982).

4.2.3a PCA of the CVD Risk Biochip Attitude Scale

Suitability analyses of the CVD Risk Biochip Attitude Scale for PCA found that a) there were many correlation coefficients of 0.3 and above in the correlation matrix, b) Bartlett's Test of Sphericity achieved statistical significance [X^2 (36) = 306.04, $p <$ 0.001] and c) the *KMO* value exceeded the recommended value of 0.6 (0.82). Despite this apparent suitability of the data for PCA, one *MSA* value in the anti-image correlation matrix obtained an *MSA* value of 0.60, which was below the recommended value of 0.7 (as per Pett et al., 2003). This item ("Diagnostic Testing should be left to the Professionals") had achieved a similarly low *MSA* value in the results of the first study and had been considered to potentially represent a different

construct to that which was of interest. As a result, it was deemed appropriate to remove this item from the scale for subsequent analyses.

Analysing the correlation matrix also indicated that the item "The CVD Risk Biochip is an exciting new device" was correlated strongly with both "Valuable New Device" (0.79) and "Unnecessary Device" (0.75). Such a high correlation with other items in the scale suggested that the item could potentially be redundant, particularly since both correlations were close to 0.80 (as per the recommendations of Pett et al., 2003). Since this item had a high correlation with two other items and had a low *MSA* value, it was decided to remove it from the scale for subsequent analyses. The remaining seven items on the scale were then reassessed for their suitability for PCA. Once again, the data appeared to be suitable for PCA; obtaining a strong *KMO* value (0.81), a statistically significant Bartlett's Test of Sphericity [X^2 (21) = 189.44, $p < 0.001$], most correlations in the correlation matrix over 0.3 (see Table 4.3 for the correlation matrix and descriptive statistics pertaining to it), all *MSA* values above 0.70 and all correlations between the items less than 0.70.

Item	1	2	3	4	5	6	7	M	SD
1. The CVD Risk Biochip makes me feel empowered about my health.	1.00							3.88	0.90
2. The CVD Risk Biochip will only serve to frighten people about their health.	0.34	1.00						3.79	1.00
3. The CVD Risk Biochip is a valuable new device.	0.58	0.31	1.00					4.46	0.73
4. Moving diagnostic testing from hospital settings to the home is a great idea.	0.52	0.35	0.48	1.00				3.85	1.02
5. The CVD Risk Biochip makes me feel anxious.	0.31	0.50	0.28	0.28	1.00			4.13	1.04
6. The CVD Risk Biochip will encourage people to take a more active approach to their health.	0.44	0.20	0.37	0.33	0.33	1.00		4.08	0.92
7. The CVD Risk Biochip is an unnecessary device.	0.55	0.34	0.67	0.44	0.49	0.55	1.00	4.42	0.73

Table 4.3: Correlation Matrix and Descriptive Statistics for the 7-Item Solution for the CVD Risk Biochip Attitude Scale

The unrotated PCA solution for these remaining seven items revealed the presence of a single component with an eigenvalue exceeding 1. Examination of the scree plot also revealed a clear break after the second component. This single component explained 50.13% of the variance among the items, which was within the expected range for social science studies indicated by Pett et al. (2003). This set of items also maintained a balance of both negatively phrased and positively phrased items, thereby avoiding the potential problems of acquiescence response set answers. A reliability analysis of these seven items revealed a Cronbach's Alpha of 0.82, with each item contributing significantly to the variance explained by the component. Following these results, the single component solution was deemed appropriate and each of the remaining seven items was retained for further analyses. Table 4.4 provides factor loadings for this single component solution.

Item	Component 1
1. *The CVD Risk Biochip is an unnecessary device.*	0.84
2. *The CVD Risk Biochip makes me feel empowered about my health.*	0.77
3. *The CVD Risk Biochip is a valuable new device.*	0.77
4. *Moving diagnostic testing from hospital settings to the home is a great idea.*	0.69
5. *The CVD Risk Biochip will encourage people to take a more active approach to their health.*	0.65
6. *The CVD Risk Biochip makes me feel anxious.*	0.62
7. *The CVD Risk Biochip will only serve to frighten people about their health.*	0.58

Table 4.4: Factor Loadings from the PCA on the 7-Item Solution for the CVD Risk Biochip Attitude Scale

4.2.3b PCA of the CVD Risk Biochip Behavioural Intentions Scale

The data pertaining to the six items on the CVD Risk Biochip Behavioural Intentions Scale were determined to be appropriate for PCA after observing that they produced many coefficients of 0.3 and above in the correlation matrix, a significant Bartlett's Test of Sphericity [X^2 (15) = 197.58, $p < 0.001$] and a *KMO* value of 0.72. Although two of the *MSA* values in the anti-image correlation matrix were below the recommended value of 0.7 (0.68 and 0.65 respectively), they were not considered to depart sufficiently from this recommended value to be of great concern, particularly since there were no clear conceptual reasons for removing these items from further analyses. Consequently, each of these six items was retained for PCA.

The unrotated PCA solution revealed the presence of a single component as there was only one component with an eigenvalue over one and the scree plot revealed a clear break after the second component. This component accounted for 55.55% of the variance alone and achieved a good balance of both negatively phrased and positively phrased items. A reliability analysis of the six items revealed a highly reliable Cronbach's Alpha of 0.83. This reliability analysis also revealed a potential increase in explained variance by approximately 6% and a minor increase in Cronbach's Alpha (of 0.007) if the item "I would buy the CVD Risk Biochip if my GP recommended it" was removed. Since this item also achieved a mean and standard

deviation that appeared very close to a ceiling effect (M = 4.67, SD = 0.47) in contrast to other items from the scale (see Table 4.2), it was decided to remove this item and re-run the analysis with the remaining five items.

Item	1	2	3	4	5	M	SD
1. If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.	1.00					3.49	1.17
2. The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it	0.52	1.00				3.71	1.18
3. At this moment, I feel particularly motivated to use the CVD Risk Biochip.	0.58	0.48	1.00			3.28	1.32
4. At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.	0.54	0.41	0.77	1.00		3.94	1.04
5. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.	0.30	0.49	0.41	0.60	1.00	4.09	1.03

Table 4.5: Correlation Matrix and Descriptive Statistics for the 5-Item Solution of the CVD Risk Biochip Behavioural Intentions Scale

The items that remained were found to be suitable for PCA; all of the correlations were greater than 0.3 in the correlation matrix (see Table 4.5 for the correlation matrix and corresponding descriptive statistics), Bartlett's Test of Sphericity returned a significant result and the data obtained a *KMO* value of 0.69. Although two *MSA* values were still below the recommended value of 0.7 (0.65 and 0.63 respectively), they were not worryingly low and these items contributed significantly to the variance explained. Analysing the scree plot revealed a clear break after the second component and there was only one component with an eigenvalue greater than 1, leading to the conclusion that a single component solution was suitable in this case (see Table 4.6 for factor loadings). As expected from the prior reliability analysis, this component accounted for 61.12% of the variance alone, supporting the use of PCA to achieve a

behavioural intentions scale that represented a single construct. A reliability analysis of these five items revealed a similarly highly reliable Cronbach's Alpha of 0.84.

Item	Component 1
1. *At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.*	0.87
2. *At this moment, I feel particularly motivated to use the CVD Risk Biochip.*	0.85
3. *If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.*	0.76
4. *The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.*	0.72
5. *At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.*	0.70

Table 4.6: Factor Loadings from the PCA on the 5-Item Solution of the CVD Risk Biochip Behavioural Intentions Scale

4.2.4 Data Preparation and Clean-up

In order to form composite scores for the CVD Risk Biochip Attitude Scale, each participant's scores on the remaining seven items of the scale were added together. Similarly, participants' scores on the five remaining CVD Risk Biochip Behavioural Intentions Scale items were added to form a composite behavioural intentions score. Separate tests of normality (Kolmogorov-Smirnov statistics, Shapiro Wilks statistics, histograms with normality plots and Normal Q-Q Plots) were then performed on each of the sets of composite scores. Although the composite behavioural intentions data appeared to closely approximate normality, there was a slight negative skew in the composite attitudes data, which was apparent from the histogram and a Shapiro Wilks value with $p < 0.05$. Upon further inspection, two cases were identified as univariate outliers (with values of 17 and 11 respectively); both of which had values of over 3 standard deviations lower than the mean ($M = 28.62$, $SD = 4.42$). One of these cases was identified through Mahalanobis distance as a very high multivariate outlier with $p < 0.001$. As there was a medium sample size in this study, it was deemed necessary to replace this score with a less deviant one rather than deleting the offending score in order that the extreme score was still represented in subsequent analyses by a low value. Tabachnick and Fidell (2007) suggest replacing such an outlying case with a

raw score on the offending variable that is one unit higher or lower than the next most extreme score in the distribution. In this case, the outlying value of 11 (which had been identified as both a univariate and multivariate outlier) was replaced with a value of 16 as the next lowest score in the distribution was 17. Although this altered score remained as a univariate outlier in the data set, it was no longer deemed to be a multivariate outlier. This minor alteration significantly improved the negative skew of the data set, achieving a Shapiro Wilks value and histogram shape that approximated normality more closely. Consequently, this slightly modified composite attitudes data set was retained for further analyses.

4.2.5 MANCOVA on Behavioural Intentions and Attitudes towards CVD Risk Biochip Scales

In order to assess if there were differences in the participants' positive or negative appraisal of the CVD Risk Biochip as a function of their experimental condition, a one-way between-groups MANCOVA was carried out with the attitudes and behavioural intentions data included as the dependent variables and gender as a covariate. As with Study 1, gender was included as a covariate in order to remove any potential bias in attitudes and behavioural intentions towards the CVD Risk Biochip that may have arisen due to gender differences in the performance of health-related behaviours (e.g. Tamres et al., 2002; Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004; Lynn et al., 2009).

Preliminary testing for the assumptions of MANCOVA revealed no serious violations in normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, multicollinearity, independence of the covariate from the experimental treatment and reliability of the measurement of the covariate. The MANCOVA analysis (see Table 4.7 for Descriptive Statistics) revealed that there were no statistically significant differences between the three groups on the combined dependent variables after controlling for gender as a covariate: $F(4, 146) = 0.48$, $p = 0.75$; Wilk's Lambda = 0.97; $\eta^2 = 0.01$. Consequently, no further post-hoc tests of between-subjects effects were deemed necessary between the groups.

Interestingly, the MANCOVA analysis revealed that the covariate of gender reached statistical significance on the combined dependent variables: $F(2, 73) = 3.19$, $p =$

0.048; Wilk's Lambda = 0.92; $\eta^2 = 0.08$. However, when the results for each dependent variable were considered separately with post-hoc ANOVAs, neither sets of differences reached statistical significance ($p > 0.05$ in each case).

	Condition	M	SD	Gender	M	SD
Attitudes Data	*Mortality Salience*	29.27	3.24	*Male*	27.81	3.89
	Heart Attack	28.73	5.04	*Female*	29.69	4.36
	Control	28.04	4.18			
Behavioural	*Mortality Salience*	18.46	3.57	*Male*	18.33	4.15
	Heart Attack	18.65	5.09	*Female*	18.69	4.91
	Control	18.38	4.83			

Table 4.7: Descriptive Statistics for the MANCOVA by Condition and Covariate of Gender

4.2.6 Logistic Regression of De Facto Intentions

A logistic regression was performed on the De Facto Intentions Measure as a dependent variable in order to assess if the participant's gender or assignment to one of the three experimental would help to predict the odds of whether or not they chose to sign up for the proposed CVD Risk Biochip pilot study. As with Study 1, gender was included to control for the potential differences between middle-aged males and females in pursuing health-oriented behaviours (e.g. Tamres et al., 2002; Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004; Lynn et al., 2009). Furthermore, in preparation for the logistic regression, the dependent variable, gender and membership to experimental group data were each coded in an identical fashion to Study 1 in order that responses on all of the variables represented binary data.

Preliminary checks of the data confirmed that there was an absence of multicollinearity between the independent variables. A test of the full model with three predictors (including the two separate variables to indicate a participant's membership to one of the experimental conditions) against a constant-only model indicated a significant difference; X^2 (3, $n = 78$) = 13.30, $p < 0.05$. This suggested that the combined predictor variables reliably distinguished whether or not a participant had signed up for the pilot study pertaining to the CVD Risk Biochip. Table 4.8 shows regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals relating to odds ratios for each of the three predictors. According to the Wald criterion, only gender, and not membership to one of the experimental groups, reliably predicted if a participant had signed up to the pilot study or not; X^2 (1, $n = 78$)

= 8.99, $p > 0.005$. Additionally, a new model was run with gender omitted as a predictor. This model was not reliably different from the constant only model; X^2 (2, $n = 78$) = 1.58, $p > 0.05$, confirming the finding that gender was a significant predictor of signing up for a CVD Risk Biochip pilot study. The odds ratio of 7.77 demonstrates that there was a significant increase in the odds of signing up for the pilot study if a participant was female. Consequently, the results of the logistic regression clearly demonstrate that, irrespective of group membership, females were more likely to sign up to the pilot study than males.

Variables	*B*	Wald Chi-Square	Odds Ratio	95% Confidence Interval For Odds Ratio	
				Lower	Upper
MORTCOND	0.20	0.09	1.22	0.34	4.39
HEARTCOND	0.47	0.44	1.59	0.40	6.27
Gender	2.05	8.99	7.77	2.03	29.70
Constant	0.10	0.05	1.11		

Table 4.8: Logistic Regression Analysis, Containing Regression Coefficients, Wald Statistics and Odds Ratios for the Predictors and the Constant Term and 95% Confidence Intervals Relating to Odds Ratios for the Predictors

4.2.7 Content Analyses of the Open-ended Salience Measures

As with the first study, a series of content analyses were conducted to check whether or not the Heart Attack Salience and Mortality Salience task elicited more thoughts concerning death among participants than the Control task as per Arndt et al. (2007) and to investigate if the former two tasks elicited more negative emotions, a greater experience of threat and a deeper writing style then the latter task. Two independent coders (the researcher and an additional coder who was unaware of the exact nature of the study) recorded the total number of death-related words ($\alpha = 1.00$) and the total number of words ($\alpha = 1.00$) used by participants in their open-ended responses. The coders also independently rated these responses with a 6-point Likert scale ranging from 0 = *not at all* to 5 = *very much* on the same four dimensions that had been used in the first study; degree of focus on death or survival themes ($\alpha = 0.99$), negativity expressed ($\alpha = 0.98$), degree of threat expressed ($\alpha = 0.98$), and shallow or deep

writing of the responses ($\alpha = 0.99$). The coders' ratings on each of these dimensions were subsequently compared and their individual ratings of each item were averaged to form a single set of scores on each dimension due to high levels of agreement between these independent sets of scores. Following this, separate ANOVAs were conducted in order to establish if there were significant differences between the groups on each dimension.

The ANOVA on the number of 6.death-related words and degree of focus on death and survival themes dimensions were both conducted at a reduced alpha level of 0.025 as per Tabachnick & Fidell's (2001) recommendations, rather than the conventional 0.05 level following the finding that both of these sets of data violated the assumption of Levene's Test of Equality of Error Variances. The former analysis revealed a main effect of the salience condition that participants received; F (2, 75) = 40.23, $p < 0.001$, $\eta^2 = 0.52$. Tukey post-hoc analyses revealed that there were a significantly greater number of death-related words in responses from participants in the Heart Attack Salience group ($M = 3.12$, $SD = 1.51$) and the Mortality Salience group ($M = 2.62$, $SD = 1.70$) compared to participants' responses in the Control group ($M = 0.08$, $SD = 0.27$), but there were no significant differences between the Heart Attack Salience group and the Mortality Salience group on this dimension. Similarly, the ANOVA relating to the focus on death or survival themes dimension revealed main effects of the salience condition; $F(2, 75) = 106.77$, $p < 0.001$, $\eta^2 = 0.74$. Post-hoc analysis revealed that the responses of participants from the Heart Attack Salience group ($M = 3.13$, $SD = 0.96$) and the Mortality Salience group ($M = 2.65$, $SD = 0.89$) were significantly more focused on death and survival themes compared to the responses of participants from the control group ($M = 0.17$, $SD = 0.37$) but there were no significant differences between the two former groups on this dimension.

The negativity and threat expressed towards the content of the salience task followed a slightly different pattern to the results in the first study. Unlike the first study, the correlation between these dimensions was not high enough to warrant combining the data pertaining to these dimensions together (0.70). The ANOVA concerning the degree of negativity expressed by participants in the salience measure revealed no effect of condition [F (2, 75) = 3.07, $p > 0.05$, $\eta^2 = 0.08$]. This suggests that there

were no significant differences between the responses of participants in the Mortality Salience group (M = 2.60, SD = 0.87), Heart Attack Salience group (M = 3.15, SD = 0.73) or the Control group (M = 2.98, SD = 0.88) with respect to the degree of negative emotions that they experienced as a result of completing this measure. However, there was a significantly greater degree of threat experienced [F (2, 75) = 7.29, $p < 0.001$, $\eta^2 = 0.16$] by participants in the Mortality Salience group (M = 2.50, SD = 0.86) and participants in the Heart Attack Salience group (M = 3.21, SD = 0.80) towards the content in the open-ended questions compared to the amount of threat experienced by participants in Control group (M = 2.23, SD = 1.17). Nonetheless, there were no significant differences between the Heart Attack Salience group and the Mortality Salience group on this dimension.

Finally, there were no main effects of salience condition on the total word count used by participants [F (2, 75) = 0.49, $p > 0.05$, $\eta^2 = 0.01$] or on the shallow or deep writing dimension [F (2, 75) = 0.06, $p > 0.05$, $\eta^2 = 0.00$]. In other words, there were no significant differences in the total number of words used by participants in the Mortality Salience (M = 29.23, SD = 17.87), Heart Attack Salience (M = 26, SD = 13.67) or Control (M = 31, SD = 22.67) groups and there were no significant differences between these groups on the degree of deep or shallow writing style expressed by their participants in the completion of the salience measure (M = 2.00, SD = 0.75, M = 2.08, SD = 0.85 and M = 2.02, SD = 0.88 respectively).

4.3 DISCUSSION

There were no significant differences between the experimental groups on either the CVD Risk Biochip Behavioural Intentions Scale or the De Facto Intentions Measure, leading to a rejection of the hypothesis that participants would have been less likely to express intentions to use the CVD Risk Biochip after heart attacks or their mortality was made salient to them and they were subsequently distracted relative to participants who had dental pain made salient to them and were subsequently distracted. Similarly, there were no significant differences between the groups on the CVD Risk Biochip Attitude Scale, resulting in the rejection of the hypothesis that participants would have less favourable attitudes towards the CVD Risk Biochip after

they had heart attacks or mortality made salient to them and received a subsequent distraction relative to participants who had dental pain made salient to them and received a subsequent distraction. Despite these non-significant findings, it was discovered that female participants in this study were significantly more likely to sign up to the proposed CVD Risk Biochip pilot study than male participants. Female participants also expressed slightly more favourable attitudes towards the device (as indicated by the significant main effect in the MANCOVA for the covariate of gender), although this finding did not translate into a significant result upon post-hoc analysis of the differences between males and females on the CVD Risk Biochip Attitude Scale.

4.3.1 Possible Explanations for the Rejection of the Experimental Hypotheses

As with the first study, the negative skew in participants' responses was unlikely to be a result of proximal or distal defences that were elicited by aspects of the questionnaire itself (see pages 1-85 - 1-89). Firstly, the lack of significant differences between the groups on the dependent variables suggests that it is unlikely that potential mortality reminders in the CVD Risk Biochip Information Sheet elicited proximal defensive reactions among participants towards the device whereby they produced a positive response towards the device as a means of denying their vulnerability towards death or having a heart attack (as per Greenberg et al., 1994; Pyszczynski et al., 1999; Pyszczynski et al., 2000; Arndt, et al., 2007). As with the first study, this is because a) it is unlikely that the negatively skewed data resulted from mortality reminders as such results are commonly associated with health-related research (e.g. Tabachnick & Fidell, 2001), b) the mortality reminders in the information sheet were relatively subtle since they did not explicitly make participants aware of their personal risk of developing CVD and c) one would expect a conscious mode of defence towards health-oriented behaviours with the potential to provide life-threatening information to be one of avoidance rather than approach as the former proximal strategy would appear to be more effective at removing mortality reminders from conscious awareness (e.g. as per Pyszczynski et al., 1999; Greenberg et al., 2000; Pyszczynski et al., 2000; Goldenberg & Arndt, 2008).

Similarly, it is unlikely that potential mortality reminders in the CVD Risk Biochip Information Sheet elicited distal defensive reactions among participants from each of

the experimental conditions, whereby all participants upheld cultural values of faith in scientific progress (as per Becker, 1975; Rutjens et al., 2009; Rutjens et al., 2010). In keeping with the first study, this is because the subtle reminders of death that may have been present in the CVD Risk Biochip Information Sheet did not represent personal mortality reminders as with previous TMT research studies. Additionally, as mentioned above, it is unlikely that the negatively skewed data were specific to subtle reminders of mortality contained in the CVD Risk Biochip Information Sheet as negative skews are often associated with attitude and behavioural intention scales in health-related research (e.g. Tabachnick & Fidell, 2001). More importantly, the availability of defensive avoidance makes it unlikely that participants in the current study would have upheld cultural values of faith in scientific progress as a distal defence towards subtle death reminders. This is because an avoidance reaction would be more effective in circumventing the possibility that participants might receive an existentially threatening health status with the potential to confer a significant blow to their self-esteem (as per Goldenberg & Arndt, 2008).

The absence of significant differences between the conditions on participants' attitudes, behavioural intentions or "De Facto Intentions" towards the CVD Risk Biochip also suggests that participants in this study did not display distal defensive avoidance towards the CVD Risk Biochip after they were asked to think about having a heart attack or their own death and were subsequently distracted relative to controls. This is because one would have expected there to have been differences between the conditions if existential anxiety resulting from thinking about having a heart attack or thinking about death were prompting a distal defensive avoidance in participants, in line with the prior TMT research relating to cancer screening (i.e. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). Additionally, following previous TMT research that has demonstrated that further subtle mortality reminders after an initial explicit mortality reminder and a subsequent distraction lead to distal defences (e.g. Greenberg et al., 2000), one would have predicted that there would have been differences between the conditions if existential anxiety were to have had an effect on participants' responses towards the device. Furthermore, one would have anticipated that there would have been a positive skew in the data pertaining to the dependent variables if there was evidence of a general pattern of distal defensive avoidance towards subtle reminders in the CVD Risk Biochip Information Sheet. Since none of

these proposed effects appears to have taken place, it can be concluded that there is no evidence of distal defensive avoidance towards the CVD Risk Biochip in the current study.

In a similar fashion to the first study, the absence of significant differences between the experimental conditions on any of the dependent variables could lead one to argue that the middle-aged participants in this study may not have found the device to be of particular relevance to their health. Despite the fact that attempts had been made to control for such an effect by explicitly priming middle-aged risk in the development of CVD in the Questionnaire Booklets, many studies in the health minimisation literature have demonstrated that people often downplay the seriousness of a health threat in order to deny their vulnerability to it, even in spite of knowledge that they have established risk factors for disease development (e.g. Eiser et al., 1979; Ditto et al., 1988; Avis et al., 1989; Croyle, 1990; Croyle et al., 1993; Croyle et al., 1997; de Hoog et al., 2007). However, as with the results of the first study, one would also have expected participants' evaluations of the device to be positively skewed (i.e. indicating that they were less interested in the device) if participants were downplaying the seriousness of the primed risk factors for developing CVD. In contrast, the pattern of participants' responses across each of the experimental conditions displayed a negative skew, thereby undermining such an explanation.

As the second study did not reveal any significant differences with respect to the dependent variables, it would also appear to suggest that a moderating effect of age on death anxiety after middle age (e.g. De Raedt & Van Der Speeten, 2008; Maxfield et al., 2007; Russac, et al., 2007; Neimeyer et al., 2004; Fortner & Neimeyer, 1999; Neimeyer & Van Brunt, 1995; Thorson & Powell, 1988) was not necessarily a central component to the similar lack of significant differences between the conditions in the results of the first study, contrary to expectations. This is because one would at least have expected there to have been significant differences between the Control condition and either the Mortality Salience or the Heart Attack Salience condition on the dependent variables in the current study if such a moderating effect of age on death anxiety had led to the lack of significant differences in the first study. In other words, in view of the proposition that the middle stage of life represents the point in the life cycle where an individual is most concerned with existential anxiety (as per

Becker, 1973) and generating symbolic meaning regarding their own existence (e.g. Erikson et al., 1986; Tornstam, 1994; Erikson & Erikson, 1997), one would have expected to find significant differences between participants' reactions towards the main dependent variables in the current study depending on whether they received a mortality reminder or not. Given that such a finding did not occur in this study and that there was no evidence of TMT defences at work in the first study either, it appears more likely that there may have been something particular about the description of the CVD Risk Biochip, the questionnaire items or something about the nature of the device itself that resulted in a lack of significant differences between the conditions in both studies on the main dependent variables of interest. If this were the case, one could argue that the CVD Risk Biochip or the questionnaire itself was somehow incompatible with typical TMT predictions. Studies 3 and 4, which are described in the following two chapters, attempted to further investigate some of these issues.

4.3.2 Gender-Related Differences Pertaining to Health Behaviours

An interesting finding in the current study was that gender appeared to have a significant impact on both the combined MANCOVA attitudes and behavioural intentions data and the logistic regression data concerning participants' intentions to sign up for a pilot study of the CVD Risk Biochip. With respect to the former result, middle-aged males tended to react less favourably towards the CVD Risk Biochip in comparison to middle-aged females. This gender effect did not appear to have significance when post hoc analyses were subsequently performed on the behavioural intentions and attitudes data separately. However, the latter finding that gender added to the predictive power of whether or not a participant signed up for the proposed pilot study is especially interesting. Considering the somewhat weak links that have been previously found between attitudes and actual behaviour or behavioural intentions and actual behaviour (e.g. Fazio & Williams, 1986; Leippe & Elkin, 1987; Morrwitz et al., 1993; Sutton, 1998; Ajzen & Sexton, 1999; Ajzen, 2000; Sheeran, 2002; Bhattacherjeea & Sanford, 2009; Carrington et al., 2010), this measure could be regarded as more ecologically valid in the sense that participants may have been more likely to express their actual intentions to use the CVD Risk Biochip when they were given the opportunity to sign up for a pilot study involving the device. This is because there is an implicit confirmation of the genuine existence of the CVD Risk Biochip in

this measure, which may have allowed participants to be relatively certain that the device existed and may have made their subsequent commitment to use the device more representative of their actual intentions. Consequently, the results of the logistic regression with respect to gender suggest that middle-aged males may be more hesitant to commit to the actual use of the CVD Risk Biochip compared to middle-aged females. This finding is consistent with health psychology literature that has found that men engage in health-oriented behaviours and health-seeking information less frequently than women (e.g. Baum & Grunberg, 1991; Courtenay, 1998; Liang et al., 1999; Van Wijk et al., 1999; Courtenay, 2000a; Courtenay, 2000b; Janda et al., 2004; Parslow et al., 2004; Evans et al., 2005; Courtenay, 2009).

The finding that a participant's gender helped to predict whether or not they signed up for the CVD Risk Biochip pilot study is also interesting in light of the absence of any such effect in the results of the first study. Indeed, there were no demonstrable differences between whether or not male and female participants over 55 years of age signed up for the pilot study in the first study. In contrast, middle-aged male participants were less likely to sign up for the pilot study than middle-aged female participants in the second study. When taken together, these results lend support to the idea that gender differences in health behaviour patterns decrease with age (e.g. Stoller & Pollow, 1994; Liang et al., 1999). Although follow-up studies would be needed in order to establish the validity and reliability of this effect, the current data could be seen to tentatively support the notion that patterns of health-seeking behaviour in females and health-avoidance in males which may result from fixed gender patterns handed down from one's culture (e.g. Fagot, 1984; Aries & Olver, 1985; Lytton & Romney, 1991; Tamres et al., 2002; Lynn et al., 2009) give way in later life to increasing concerns about diseases and health status as an individual grows older and becomes increasingly more susceptible to illness and disease (e.g. Courtenay, 1998; Stoller & Pollow, 1994).

4.3.3 Content Analyses of the Salience Measure

In line with the results of the first study, the findings of the content analyses of the salience measure revealed that the Heart Attack Salience task was just as likely to elicit death-related words and death and survival themes as the Mortality Salience task. Indeed, the Heart Attack Salience and Mortality Salience tasks both produced a

significantly greater number of death-related words in participants' responses than the Control task and led participants to focus on significantly more death and survival themes than those who received the Control task. These analyses also replicated the findings from the first study that there were no significant differences between the responses of participants in the Heart Attack Salience and Mortality Salience measures on these dimensions. Therefore, these results tend to lend further support to the idea that the Heart Attack Salience task is a valid measure for priming thoughts concerning death as they suggest that the Heart Attack Salience measure primes thoughts of death to the same degree as the Mortality Salience measure. However, such results also tend to suggest that Heart Attack Salience is not an analogous measure to Arndt et al.'s (2007) Cancer Salience measure. This is because Heart Attack Salience tends to elicit a similar number of death-related words and a similar degree of focus on death and survival themes to Mortality Salience, whereas Arndt et al. (2007) found that their Cancer Salience measure led to a greater number of death-related words and a greater degree of focus on death and survival themes in participants' responses compared to Mortality Salience. Nonetheless, this finding also lends further support to the idea that receiving a Heart Attack Salience task and a subsequent distraction should lead to distal defensive responses (i.e. following prior TMT research, such as Greenberg et al., 1994; Pyszczynski et al., 1999; Pyszczynski et al., 2000; Arndt, et al., 2007).

In addition to the above result, participants in both the Heart Attack Salience and the Mortality Salience conditions found the content of the salience measure that they received to be more threatening than participants in the Control condition and there were no significant differences between participants' responses towards the Heart Attack Salience and Mortality Salience tasks on this dimension. This finding reflects the idea that death and heart attacks are potentially very threatening to a group of middle-aged participants; potentially because either of these events may impede their life goals (e.g. Becker, 1973; Erikson et al., 1986; Erikson & Erikson, 1997). Additionally, when related back to the results of the first study, this finding supports the proposition that people experience a moderating effect of death anxiety with advancing age (e.g. Thorson & Powell, 1988; Neimeyer & Van Brunt, 1995; Fortner & Neimeyer, 1999; Neimeyer et al., 2004; Maxfield et al., 2007; Russac, et al., 2007; De Raedt & Van Der Speeten, 2008). This is because, in contrast to the middle-aged

participants in the second study who found thinking about death to be a very threatening prospect, participants in the first study did not find death to be particularly threatening.

It is interesting to note that the negativity dimension did not yield significant differences between the conditions in this study. Contrary to expectations, participants considered thinking about dental pain, death or heart attacks to be very negative (each $M > 2.5$). Many of the participants from this age cohort who wrote about dental pain used similar language to those participants who wrote about heart attacks or those participants who wrote about death. For instance, a number of these participants referred to dental pain as "almost unbearable" and the process of visiting the dentist as "frightening". In the same breath, while these people appeared to find the experience of dental pain to be one which is particularly negative, they did not appear to find dental pain to be quite as threatening as heart attacks or death itself, as evidenced by their different responses to the threat dimension.

Finally, there were no significant differences between the conditions in either the total number of words used or the degree of deep or shallow writing used by participants. While the former result once again tallies with the results of Study 1 and Arndt et al.'s (2007) identical findings, the latter result is distinct from the findings of Study 1 where it was revealed that older adults who were asked to think about heart attacks or death tended to respond with deeper writing than older adults who were asked to think about dental pain. This may be because older adults have had greater opportunities to think symbolically about heart attacks and death as they may have had more exposure to friends and relatives dying or having heart attacks.

Chapter 5: Study 3

The findings of Studies 1 and 2 taken together suggest that receiving either a Mortality Salience or Heart Attack Salience task and a subsequent distraction does not appear to lead to significantly more avoidant responses towards the CVD Risk Biochip than receiving a control task from either a cohort of participants aged over 55 years or a cohort of participants aged 40-55 years. However, it is possible that the potentially very threatening nature of thinking about having a heart attack led to a suppression of death-related thoughts for participants in the Heart Attack Salience conditions in these studies, even after the distraction occurred[*]. Although this was not reflected in the results of the content analyses of the first two studies (i.e. since participants produced a similar number of death-related words and appeared to express a similar degree of focus on death and survival themes in their responses to the Mortality Salience and Heart Attack Salience tasks), it is possible that participants' responses to the open-ended questions about heart attacks underestimated the threatening nature of heart attacks to them. In other words, the tangible nature of heart attacks may have been experienced as more existentially threatening to participants in these studies than they reported. If this was the case, participants who completed the Heart Attack Salience task and were given a subsequent distraction may have experienced a more sustained suppression of death-related thoughts in a similar fashion to Arndt et al.'s (2007) findings in Study 1 of their research programme that the very threatening nature of thinking about cancer led to a continued suppression of death-related thoughts for participants after a similar distraction. This may have meant that these participants responded differently towards the device than predicted as they continued to suppress thoughts about having a heart attack after they completed the distraction task. In contrast, placing participants under conditions of increased cognitive load and providing them with a Heart Attack Salience task to complete may prevent this increased suppression of death-related thoughts, in line with Arndt et al.'s (2007; Study 2) findings that their participants who received a Cancer Salience task to complete while under conditions

[*] I would like to explicitly acknowledge Dr. Cathy Cox from Texas Christian University for suggesting this possibility to me at the Society for Personality and Social Psychology Conference 2011 in San Antonio, Texas. Dr. Cox is one of the leading proponents of TMT and was a co-author on the Arndt et al. (2007) paper.

of increased cognitive load did not display an increased suppression of death-related thoughts.

Following the above ideas, a third study investigated if there was a difference in the accessibility of death-related thoughts between participants who were asked to think about having a heart attack while under conditions of cognitive load and participants who were given a distraction task after being asked to think about having a heart attack. This method was designed to reveal whether or not participants continued to suppress death thoughts after Heart Attack Salience and a subsequent distraction. In other words, the current study was constructed in order to clarify the conditions under which people suppress death-related concepts after thinking about having a heart attack. The study was also designed to clarify whether or not the lack of significant differences between the Heart Attack Salience and Control conditions in the first two studies of the current research programme resulted from the continued suppression of death-related thoughts among participants in the Heart Attack Salience conditions after they were given a distraction task. In order to accomplish the above objectives, the current study used a methodology derived from the DTA branch of the TMT literature.

5.0.1 Death-Thought Accessibility (DTA) in TMT

The DTA branch of the TMT literature is primarily concerned with the empirical assessment of the suppression of death-related thoughts following Mortality Salience or similar methodologies that prime existential concerns. Beginning with Greenberg et al.'s (1994) seminal paper, this area of TMT has been important in establishing the cognitive processes underlying the management of existential concerns (for a comprehensive review of the DTA literature see Hayes, Schimel, Arndt & Faucher, 2010). In this regard, a plethora of DTA research has found that the extent of the suppression of death-related thoughts varies depending on whether these thoughts are conscious or they are outside a person's focal awareness. Specifically, this research has demonstrated that the suppression of death-related thoughts is strong immediately after existential concerns are made conscious due to proximal defences and that, following this initial suppression, death-related thoughts then become hyperaccessible to individuals (e.g. Greenberg et al., 1994; Arndt et al., 1997b; Greenberg et al., 2000). Additionally, research from DTA has found that if the cognitive resources

required to actively suppress existential concerns are put under increasing demands, such as having to retain a piece of information in one's short-term memory, that this initial suppression process is circumvented and death-related thoughts become hyperaccessible to individuals (e.g. Arndt et al., 1997b; Arndt et al., 2007). Similarly, Arndt et al. (1997b) found that this initial suppression process is circumvented and death-related thoughts become hyperaccessible when death-related words are subliminally presented to individuals. In short, the above research has shown that death-related thoughts become hyper-accessible to individuals, either after a delay or distraction following their initial suppression (e.g. via Mortality Salience) or when the death-related thoughts are presented to them in ways that serve to circumvent the initial suppression process (e.g. when mortality is made salient to an individual who has been placed under conditions of increased cognitive load). Relating this research to the wealth of evidence concerning distal defensive strategies such as cultural worldview defence and the pursuit of self-esteem relevant behaviours among individuals, TMT researchers have argued that it is this hyperaccessibility of death-related thoughts that prompts these strategies (Hayes et al., 2010).

In order to investigate the degree of suppression of death-related thoughts, TMT research on DTA has typically used a word-fragment completion methodology. Word-fragment completion methodologies have been used in psychological research since the late 1950s (e.g. Miller & Friedman, 1957). Those studies which have employed this methodology have mostly been used to demonstrate priming effects or have provided evidence to support the cognitive processes underlying conceptual activation and memory retrieval (e.g. Bassili & Smith, 1986; Srinivas, Roediger & Rajaram, 1992; MacLeod & Kampe, 1996; Sia, Lord, Blessum, Thomas, & Lepper, 1999; Smallwood, 2004). The adaptation of this methodology for DTA research was originally developed by Greenberg et al. (1994) and derived from prior research concerning the trait attributions that people make based on descriptions of others' behaviours (Bassili & Smith, 1986). As with many other versions of the word fragment completion task, this variation of the methodology relies on the notion that one can make indirect inferences about the salient cognitions of an individual that are below their conscious awareness on the basis of their responses to an ambiguous and seemingly unrelated task that allows for such salient cognitions to be revealed (Hayes et al., 2010). In this instance, participants are presented with a task where they are

asked to complete ambiguous word fragments, several of which can be completed either as a neutral or death-related word. DTA researchers argue that the way in which these word fragments are completed by participants has the potential to reveal the degree to which death-related thoughts are present in their consciousness. In other words, these researchers contend that the number of death-related words that participants complete in one of these measures can be taken as an indication of whether or not death-related thoughts have been made conscious for them or the extent to which such thoughts are just below their conscious awareness yet still accessible to them.

There have also been a number of alternatives to the word-fragment completion task in DTA research. A common alternative to this methodology involves a lexical decision task, where participants are asked to distinguish between words (a mixture of death-related words, negative words and neutral words) and non-words that are presented to them on a computer screen and their reaction times in completing this task are recorded (e.g. Bassett, 2005; Koole & Van den Berg, 2005; Schimel et al., 2007; Hayes et al., 2008). DTA researchers who have used this methodology have suggested that a high level of DTA is associated with significantly faster reaction times towards death-related words compared to non-words, negative words or neutral words and several studies using this methodology have corroborated results from the word-fragment completion methodology on this basis (e.g. Arndt et al., 2007; Hayes et al., 2008). Alternatively, Gailliot, Schmeichel & Baumeister (2006) used a methodology where participants were presented with images that could be perceived as either death-neutral or death-related. For instance, one of their images could be perceived as either a lady sitting in front of a large mirror or as a skull. These researchers argued that a participant's level of DTA could be inferred on the basis of their perception of such images (i.e. if participants perceived such images in the death-related mode, it was taken as an indication of a high level of DTA). Using this methodology, they were able to add further support to the results concerning DTA that had been uncovered in the word-fragment completion studies.

Using the above methodologies, DTA research has been instrumental in uncovering the role of proximal and distal defences in TMT (e.g. Greenberg et al., 1994; Arndt et al., 1997b; Greenberg et al., 2000) and has been used to support many of the central

tenets of TMT research. For instance, DTA research has demonstrated that participants who have their self-esteem temporarily boosted or are given the opportunity to defend a valued aspect of their cultural worldview show evidence of a reduction in their DTA after Mortality Salience (e.g. Harmon-Jones et al., 1997; Mikulincer & Florian, 2002; Jonas & Fischer, 2006). DTA research has also uncovered some unique findings in the TMT domain such as the discovery that close relationships can moderate the effects of Mortality Salience on DTA (e.g. Mikulincer & Florian, 2000), that highlighting the death-related consequences of risky behaviours such as binge drinking, unsafe driving and tobacco use can lead to increases in DTA following a delay (e.g. Taubman-Ben-Ari, 2004; Jessop & Wade, 2008; Hansen et al., 2010), that thinking about the creaturely nature of being human can lead to an increase in DTA in the distal mode of defence (e.g. Goldenberg et al., 1999; Goldenberg et al., 2002) and that threatening important values that an individual may have can lead to increases in their DTA (e.g. Landau et al., 2004a; Hirschberger, 2006).

Most importantly for the current study, Arndt et al. (2007) found that participants who were primed with Cancer Salience and given a distraction task to complete did not exhibit significantly different levels of DTA compared to control participants and that the former participants demonstrated significantly lower levels of DTA following a distraction compared to participants who were primed with Mortality Salience. However, these TMT researchers also found that participants who were placed under high cognitive load and given a Cancer Salience task demonstrated significantly higher levels of DTA than a control group who were placed under similar conditions of high cognitive load. The researchers reasoned that these combined findings were an indication that cancer is more existentially threatening than the abstract concept of death itself, leading to a greater initial suppression of death-related thoughts following Cancer Salience. In this way, they argued that, when their participants who were asked to think about contracting cancer were in a conscious mode of processing, they tended to defensively suppress death-related thoughts for a longer time-frame than those participants who were asked to think about their own death. In contrast, the researchers maintained that those participants who were placed under conditions of high cognitive load and asked to think about contracting cancer exhibited high levels

of DTA as they were unable to suppress death-related thoughts due to being placed under increased processing demands.

5.0.2 The Current Study

Following Arndt et al.'s (2007) research, it was deemed possible that the potentially very threatening nature of thinking about a heart attack led participants in the first two studies to continue to suppress death-related thoughts after they were subsequently distracted, resulting in different responses towards the CVD Risk Biochip than had been predicted through TMT. More specifically, participants from the first two studies who received a Heart Attack Salience task and subsequent distraction may have used a consciously rational strategy of exhibiting highly positive attitudes towards the CVD Risk Biochip and elevated intentions towards the device in order to push the problem of death into the future as they were unable to suppress the highly threatening and existentially-relevant thoughts about having a heart attack. This is in contrast to the proposed distal defensive responses of increased negative attitudes and avoidant responses towards the device that were expected among participants following Heart Attack Salience and a subsequent distraction. As mentioned previously, the possibility that participants in the first two studies exhibited the former proximal defensive strategy was considered to be remote for a couple of reasons. Firstly, proposition one of the TMHM suggests that individuals will engage in a proximal defence strategy to the extent that it is effective in facilitating the removal of the mortality reminders from their immediate cognisance (Goldenberg & Arndt, 2008). As noted in the Discussion section of the first study (pages 1-85 - 1-87), this sort of proximal defensive strategy is unlikely to be effective in facilitating the removal of mortality reminders since agreeing to use the CVD Risk Biochip could potentially lead to the discovery of life-threatening information. In contrast, a proximal strategy of defensive avoidance would appear to more readily push mortality reminders associated with death into the future. Secondly, the findings from the content analyses of responses to the salience measures in the first two studies suggest that participants were just as likely to elicit thoughts concerning death and death and survival themes after receiving the Heart Attack Salience task as those who received the Mortality Salience task (i.e. these measures appear to be comparable in their propensity to elicit death-related thoughts). Nonetheless, as mentioned earlier, it was possible that participants who received a Heart Attack Salience task to complete

underestimated the threatening nature of heart attacks in their open-ended responses to this task. Following this possibility, it was considered important to investigate the likelihood of whether or not proximal defences had occurred in the first two studies in order to establish the validity of the results of these studies. Therefore, following Arndt et al.'s (2007) Study 2, it was reasoned that placing participants under increased cognitive load might disrupt such a continued suppression process, thereby preventing the continued persistence of proximal strategies from occurring after Heart Attack Salience. In order to test this possibility, the current study was explicitly based on the design of this second study from Arndt et al.'s (2007) research programme, where participants had been given either a Cancer Salience task or the standard Control task concerning thoughts about dental pain, in combination with either a cognitive load task or a distraction task. As with Arndt et al.'s (2007) Study 2, the Mortality Salience measure was also removed from the design of the current study as this measure has already been consistently found to lead to high levels of death-thought accessibility with both cognitive load and distraction tasks in the TMT literature (e.g. Greenberg et al., 1994; Arndt et al., 1997b; Greenberg et al., 2000).

In sum, the current study was explicitly designed to investigate if participants' DTA (as measured by the standard word-fragment completion task derived from the TMT literature) levels would be higher after Heart Attack Salience when participants were placed under increased cognitive load (in this case, being asked to mentally rehearse a number, as per Arndt et al., 1997b) compared to participants who were given the same distraction task that had been used in the first two studies of the current research programme following Heart Attack Salience. In line with Study 2 of Arndt et al.'s (2007) programme of research, it was predicted that those participants who were given the cognitive load task would display significantly higher DTA after Heart Attack Salience than those who were given the distraction task following Heart Attack Salience. Additionally, in accordance with the findings from Study 2 of Arndt et al.'s (2007) research programme, it was predicted that participants who were given the cognitive load task in conjunction with Heart Attack Salience would display significantly higher DTA than participants who were given either a cognitive load task or a distraction task in combination with the same death-neutral Control task that had been given to participants in the first two studies (i.e. where they were asked to think about encounters with dental pain). Finally, following the results of the first two

studies in the current research programme and Study 1 of Arndt et al.'s (2007) research programme, it was predicted that participants who were primed with Heart Attack Salience and subsequently given a distraction task to complete would not display significant differences in their level of DTA to either of the Control conditions.

5.1 METHOD

5.1.1 Design and Participants

This study used a 2 x 2 independent measures design as a function of the suppression-related measures (cognitive load or distraction task) and salience task (Heart Attack Salience or Control) that participants received. Participants were randomly assigned to the Cognitive Load/ Heart Attack Salience, Distraction/ Heart Attack Salience, Cognitive Load/ Control or Distraction/ Control conditions respectively via block randomisation of the Questionnaire Booklets.

Seventy-two undergraduate students from Dublin City University who were enrolled in either Nursing or Psychology courses (7 males and 65 females[*]) volunteered to participate. It was not considered necessary to recruit middle-aged or older adults in this particular study as the main dependent measure (DTA) did not involve the relevance of a CVD-related device to participants' health. Additionally, Arndt et al. (2007) had demonstrated that thoughts about developing cancer led to increases in death-related thoughts among student participants who were placed under conditions of high cognitive load. Following their logic, it was reasoned that thinking about having a heart attack should lead to similar increases in death-related thoughts when student participants were placed under conditions of high cognitive load. A sample size of 72 participants was sought in preparation for a 2x2 between-subjects ANOVA. As with the first two studies, this sample size of 18 participants per group was determined after consulting Cohen's (1992) tables in light of the typically large effect sizes reported in TMT research (as per Arndt & Vess, 2008).

[*] It should be noted that, while the gender balance among participants in this study was not ideal, it was not expected that female and male participants would exhibit differences in their DTA levels, in accordance with Arndt et al.'s (2007) findings that both male and female participants were equally likely to exhibit higher DTA levels following thoughts about developing cancer.

5.1.2 Procedure and Materials

As with the first two studies, ethical approval was sought and granted for the current study from the DCU Research Ethics Committee. After being given the initial brief verbal account of the study, participants were given a Plain Language Statement (Appendix B3) to read before completing one of the experimental questionnaires. This Plain Language Statement indicated the source of funding to participants and ensured them that all data would be stored anonymously and that they were free to withdraw at any time during the study. Participants were also given the opportunity to ask any questions that they had in relation to the study before they begun. Once they were satisfied, participants were given one of the Questionnaire Booklets (Appendix E1-E4) to complete.

Participants in the two Cognitive Load conditions received Questionnaire Booklets where they were initially presented with an eleven digit number, which they were instructed to mentally rehearse for later recall (as per Arndt et al., 1997). Participants in the Heart Attack Salience conditions then received a task consisting of two open-ended questions allowing them to explicitly think about having a heart attack and what happens to them when they physically have a heart attack (the Heart Attack Salience task used in the first two studies). In contrast, participants in the Control conditions received a task consisting of similar open-ended questions relating to dental pain (the Control task used in the first two studies). Participants in the Distraction conditions initially received either the Heart Attack Salience or Control task. This was followed by the distraction task taken from the TMT literature that had also been used in the first two studies.

After completing one set of the above measures, participants were then introduced to the dependent variable, consisting of a DTA measure taken from Greenberg et al. (1994). This measure consists of twenty-five word fragments for participants to complete with the first word that came to mind, which had been counter-balanced for order of presentation. Six of the twenty-five word fragments could have been completed with both neutral and death-related words. For example, the word fragment “COFF_ _” could have been completed with the death-related word “COFFIN” or the death-neutral word “COFFEE”. The number of death-related words

completed by participants was used as an indication of how accessible death-related words were to them.

5.1.3 Ethical Issues

As with the first two studies, the potential risk of getting participants to think about having a heart attack was addressed by participants confirming that they had not previously experienced a significant negative heart-related event (e.g. a heart attack) before taking part in the study. Participants were also assured at the outset of the study that they were free to withdraw from the study at any time, without completing the questionnaire and without giving any reason for withdrawing in the event that they found any of the questions to be unduly distressing. In a similar fashion to the first two studies, the concern in relation to the fact that the true nature of the research was hidden from potential participants from the outset was addressed by ensuring that participants received a thorough debriefing after the study was completed that revealed the purpose of the study, any deceptions used, and why they were needed to study the question at hand. This debriefing constituted a short Microsoft PowerPoint® presentation after participants had finished the Questionnaire Booklets. In addition to this presentation, participants were given a Debriefing Sheet (Appendix G3) to take away with them. Finally, they were also given the opportunity to raise any additional questions or concerns that they had about the study at this point and they were given the researchers' contact information in the event that they were uncomfortable in addressing these concerns in the classroom environment. As with the first two studies, no participants raised any concerns or made any complaints over how the study was conducted.

In the current study, the procedure for recruitment was explicitly designed in accordance with the Dublin City University Research Ethics Committee's directions in order to ensure that the student participants did not feel subtly coerced into taking part in the study. In this regard, students were initially approached at the end of the previous lecture of the appropriate course and informed that they had the option to participate in a research study concerning "the relationship between personality characteristics and how well people can perform two tasks at the same time" during the first 20 minutes of the next scheduled lecture of the course. During this first contact, the students were instructed that they did not need to show up to the first 20

minutes of the subsequent lecture when the study was being conducted in the event that they did not want to participate in the study. The students were also assured that failure to participate would not affect their ongoing assessment, grades or their relationship with the university in any way. At the beginning of the next lecture, the participants were then given a verbal account of the study, consisting of the description of the study as contained in the Plain Language Statement (i.e. the types of tasks that participants would be asked to complete and roughly what the questions would be about as per previous TMT research).

5.1.4 Data Analyses

As mentioned above, the design of the current study was based on Study 2 of Arndt et al.'s (2007) research programme in order to investigate if the cognitive dynamics that they uncovered in relation to participants' responses to their Cancer Salience task were similar to participants' responses to the novel Heart Attack Salience task in the current research programme. Consequently, the current study also replicated the analysis-strategy of Study 2 of their research programme. Specifically, in line with Study 2 in their programme, a two-way between subjects ANOVA was performed on the DTA measure in the current study in order to investigate if there were differences in the number of death-related word stems that participants completed by virtue of the suppression-related measure or salience task that they had received.

5.2 RESULTS

5.2.1 Sample Characteristics

Demographic information pertaining to the total sample is given in Table 5.1. The mean age of participants was 22.93 with a standard deviation of 5.79.

Variable	N	%
Age		
18-25	52	72.2
26-42	20	27.8
Gender		
Male	7	9.7
Female	65	90.3

Table 5.1: Demographic Information for Study 3

5.2.2 Data Cleanup and Tests of Normality

The number of death-related word stems completed in each questionnaire booklet was initially summed in order to achieve a single score for each participant on the DTA measure. The resultant data set was then subjected to tests of normality (Kolmogorov-Smirnov statistics, Shapiro Wilks statistics, histograms with normality plots and Normal Q-Q Plots), which revealed a minor positive skew. However, after attempting several data transformations according to Tabachnick & Fidell's (2007) guidelines that did not greatly improve upon the normality of the data, it was decided to preserve the untransformed data set for the subsequent ANOVA analysis.

5.2.3 ANOVA results for the Death-Thought Accessibility Measure

A 2 x 2 between-subjects ANOVA was performed on the DTA data in order to assess whether or not giving participants either a cognitive load or a distraction task had a differential impact on the number of death-related word stems completed by them following Heart Attack Salience, and whether or not these responses were significantly different to the responses of participants who were given either of the suppression-related measures in conjunction with the death-neutral Control task. Some minor heterogeneity was detected via Levene's test of Equality of Error Variances ($p = 0.04$). Consequently, the ANOVA was conducted at a reduced alpha level of 0.025, following Tabachnick & Fidell's (2007) recommendations.

The ANOVA revealed no significant main effects of DTA between the conditions on either the suppression-related measures [F (1, 68) =3.85, $p = 0.05$] or the salience task [F (1, 68) = 0.06, $p = 0.81$] that participants received. Similarly, there was no interaction effect on DTA between the two independent measures [F (1, 68) = 0.06, p

= 0.81]. Table 5.2 displays Descriptive Statistics for the ANOVA. These results suggest that participants who received a Heart Attack Salience measure did not exhibit significantly higher DTA compared to control participants, irrespective of whether or not they received conditions of increased cognitive load or a distraction task.

Salience Task	**Suppression-Related Measure**	**M**	**SD**
Heart Attack Salience	*Cognitive Load*	1.94	1.23
	Distraction	1.56	0.92
Control	*Cognitive Load*	1.94	0.87
	Distraction	1.44	0.71

Table 5.2: Descriptive Statistics for the Death-Thought Accessibility Measure by Salience Condition and Suppression Task

5.2.4 Content Analysis of the Open-Ended Salience Measures

As with the first two studies, a series of content analyses were performed on participants' responses to the open-ended salience measures. Following Arndt et al. (2007), these analyses were conducted in order to investigate if thinking about having a heart attack tended to elicit more thoughts about death, greater negativity and a greater degree of threat than thinking about dental pain in participants' open-ended responses to the Salience measures. Once again, the researcher and an additional independent coder who was unaware of the exact nature of the study recorded the number of participants' death-related words (α = 1.00) and the total number of words (α = 1.00) in their open-ended responses. Additionally, the coders rated their responses on the following four dimensions, using a 6-point Likert scale, ranging from 0 = not at all to 5 = very much; degree of focus on death or survival themes (α = 0.99), negativity expressed (α = 0.97), degree of threat expressed (α = 0.97), and shallow or deep writing of the responses (α = 0.98). After each coder had independently rated each of the items on these dimensions, these ratings were compared and displayed high levels of agreement. Consequently, the coders' responses on each of the Likert scale items were averaged to form a single set of scores on each dimension. As per Arndt et al.'s (2007) method, separate 2 (Heart Attack vs. Control) x 2 (Cognitive Load vs. Distraction) ANOVAs were conducted on

each of these dimensions, except in the cases of the negativity and threat dimensions, where a 2x2 ANOVA was conducted on an averaged threat-negativity dimension, as these two measures were very highly correlated ($r = 0.71$).

A violation of Levene's Test of Equality of Error Variances led to the ANOVA on the number of death words in the open-ended questions being conducted at a reduced alpha level of 0.025, rather than the conventional 0.05 level, as per Tabachnick & Fidell's (2001) recommendations. This analysis revealed a significant main effect of salience task [F (1, 68) = 103.99, $p < 0.001$, $\eta^2 = 0.61$]. In other words, there was a greater number of death-related words in participants' open-ended responses to the Heart Attack Salience task ($M = 2.53$, $SD = 1.40$) compared to the Control task ($M = 0.08$, $SD = 0.28$). However, there was no evidence of a main effect of the suppression-related measures [F (1, 68) = 0.48, $p > 0.05$, $\eta^2 = 0.01$] or an interaction effect between the two independent variables in combination [F (1, 68) = 0.36, $p > 0.05$, $\eta^2 = 0.01$]. The ANOVA results for participants' degree of focus on death and survival themes also revealed a main effect of salience task [F (1, 68) = 142.74, $p < 0.001$, $\eta^2 = 0.68$], but no effect of the suppression-related measures [F (1, 68) = 0.95, $p > 0.05$, $\eta^2 = 0.01$] or interaction between these variables [F (1, 68) = 0.46, $p > 0.05$, $\eta^2 = 0.01$]. As with the number of death words, there was a significantly greater focus on death and survival themes in participants' responses in the Heart Attack Salience condition ($M = 3.54$, $SD = 0.89$) compared to the responses of participants from the Control condition ($M = 1.33$, $SD = 0.66$). In a similar fashion, there was a significantly greater degree of threat-negativity [F(1, 68) = 28.71, $p < 0.001$, $\eta^2 = 0.30$] in participants' responses towards the Heart Attack salience task ($M = 3.75$, $SD = 0.83$) compared to the Control task ($M = 2.81$, $SD = 0.64$) but no effect of the suppression-related measures [F(1, 68) = 0.40, $p > 0.05$, $\eta^2 = 0.01$] or an interaction between the two variables [F(1, 68) = 0.03, $p > 0.05$, $\eta^2 = 0.00$].

Finally, with respect to the total word count in participants' responses, there were no significant main effects for either the suppression-related measures [F (1, 68) = 3.08, $p > 0.05$, $\eta^2 = 0.04$] or the salience task [F (1, 68) = 1.15, $p>.05$, $\eta^2 = 0.02$] and no significant interaction effect of these two variables in combination [F (1, 68) = 0.06, p > 0.05, $\eta^2 = 0.00$]. However, the ANOVA results for the deep vs. shallow writing

dimension revealed a significant main effect for salience task [$F(1, 68) = 8.18$, $p > 0.05$, $\eta^2 = 0.11$] but no significant difference with respect to the suppression-related measures [$F(1, 68) = 0.12$, $p > 0.05$, $\eta^2 = 0.00$] and no evidence of an interaction between the suppression-related measures and salience task [$F(1, 68) = 0.00$, $p > 0.05$, $\eta^2 = 0.00$]. More particularly, participants in the Heart Attack Salience conditions ($M = 2.93$, $SD = 0.97$) exhibited a greater degree of deep writing than participants in the Control conditions ($M = 2.24$, $SD = 1.07$).

5.2.5 Frequency Data for the Word Fragment Completions

During the data entry stage, it was observed that some of the words that participants used to complete the potentially death-relevant word fragments in the word fragment completion task tended to recur, regardless of a participant's group membership. Following this finding, word frequency data was recorded for the death-relevant word fragments. In Table 5.3, frequency information is displayed for the death-relevant word fragment completions, the most frequent death-neutral word fragment completions and the other word fragment completions used by participants.

	Heart Attack Salience Condition			Control Salience condition		
Word Fragment	**Completion**	**Frequency**	**%**	**Completion**	**Frequency**	**%**
BUR_ _D	*Buried*	25	34.72	*Buried*	19	26.39
	Burned	5	6.94	*Burned*	13	18.06
	Other (3)*	6	8.33	*Other (2*)*	4	5.56
KI_ _ED	*Killed*	17	23.61	*Killed*	22	30.56
	Kissed	10	13.89	*Kicked*	10	13.89
	Other (3)*	9	12.5	*Other (2*)*	4	5.56
DE_ _	*Dead*	10	13.89	*Dead*	10	13.89
	Deal	5	6.94	*Dear*	6	8.33
	Other (9)*	21	29.17	*Other (10*)*	20	27.78
SK_ _L	*Skull*	7	9.72	*Skull*	7	9.72
	Skill	27	37.5	*Skill*	28	38.89
	Other (1)*	2	2.78	*Other (1*)*	1	1.39
GRA_ _	*Grave*	4	5.56	*Grave*	1	1.39
	Grass	21	29.17	*Grass*	19	26.39
	Other (6)*	11	15.28	*Other (7*)*	16	22.22
COFF_ _	*Coffin*	0	0	*Coffin*	2	2.78
	Coffee	36	50	*Coffee*	34	47.22
	Other	0	0	*Other*	0	0

* Numbers in parenthesis after "other" denote the number of other words used to complete the corresponding word fragment

Table 5.3: Frequency Information by Condition for Words Used by Participants in the Word Fragment Completion Task

5.3 DISCUSSION

The lack of significant differences between the experimental conditions on the word-fragment DTA measure led to a rejection of the hypothesis that those participants who were placed under increased cognitive load would be more likely to exhibit greater death-related thoughts following Heart Attack Salience than those participants who were given the distraction task following Heart Attack Salience. Similarly, the prediction that participants who were placed under increased cognitive load would

display significantly higher DTA following Heart attack Salience in comparison to participants who were given either the cognitive load task or distraction task in addition to the death-neutral Control task was rejected following this pattern of insignificant results. However, the prediction based on the first two studies that participants who were given the distraction task following Heart Attack Salience would not display significant differences in their DTA to either of the control conditions was supported by the same pattern of non-significant results.

5.3.1 Interpretation of the Main Results

The finding that participants who were placed under conditions of increased cognitive load and given the Heart Attack Salience task did not display significantly higher levels of DTA than participants from either of the control conditions suggests that placing an increased burden on an individual's cognitive system and asking them to think about having a heart attack may not lead to a greater availability of implicit thoughts of death compared to baseline levels. Such results differ substantially from Arndt et al.'s (2007) findings that giving participants an increased cognitive load and a Cancer Salience measure leads to significantly higher levels of DTA in comparison to giving participants a Cancer Salience measure and a distraction or providing them with an analogous control measure. In contrast, the current pattern of results implies that Heart Attack Salience and Cancer Salience are not equivalent measures in terms of their capacity to elicit existential threat. Indeed, while one would anticipate that someone who is given a Heart Attack Salience task to complete would display high levels of DTA, at least under conditions of increased cognitive load following previous TMT health-related research, due to a spreading activation between thoughts of heart attacks and thoughts of death (e.g. Arndt et al., 2002; Arndt et al., 2007), the results of the current study suggest that neither conditions of increased cognitive load nor a subsequent distraction leads to increases in DTA following Heart Attack Salience. Since the results of the content analyses in the current study (discussed below) and the results of the content analyses in the first two studies appear to suggest that thinking about having a heart attack leads to significantly more thoughts concerning death than thinking about a control topic, it is highly unlikely that the lack of increases in DTA following Heart Attack Salience in the current study reflects a lack of association between thoughts about heart attacks and thoughts of death. Consequently, it appears that Heart Attack Salience may somehow circumvent the

normal TMT suppression process, where distal defences are exhibited following increased cognitive load and thinking about a death-relevant concept.

This circumvention of the normal TMT suppression process with respect to Heart Attack Salience may have occurred in the current study due to participants minimising the importance and relevance of heart attacks to their own health, following previous research on CVD denial and self-exemption (e.g. Avis et al., 1989; Croyle et al., 1993; Mengden et al., 1998; Newell et al., 1999; Van Steenkiste et al., 2004; Peretti-Watel et al., 2007; Huerta et al., 2009). In this way, persistent beliefs among participants that heart attacks were not relevant to their own health may have undercut the potential for Heart Attack Salience to elicit existential anxiety. This may be particularly relevant to the current study, where student participants may have held steadfast beliefs that heart attacks were not relevant to their health. This explanation is corroborated by findings from the broader literature that younger adults often harbour beliefs that they are less vulnerable to health threats (e.g. Jemmott et al., 1986; Avis et al., 1989; Wild, Hinson, Cunningham & Bacchiochi, 2001; Taubman - Ben-Ari & Findler, 2005) and also tend to be less likely to engage in screening for heart-related diseases (e.g. Davis et al., 1998).

While the hypothesis that participants who were given the distraction task following Heart Attack Salience would not display significant differences in their DTA to the control conditions was supported, this result may have occurred for different reasons to those originally expected. Specifically, it was originally proposed that such a result would indicate that thoughts about having a heart attack should lead to a greater initial suppression of death-related thoughts, following Arndt et al.'s (2007) explanation of the analogous finding in the results of their first study. However, this explanation does not appear to hold up to scrutiny in the current study, following the above finding that thinking about having a heart attack under conditions of increased cognitive load also failed to lead to significantly greater levels of DTA among participants compared to thinking about dental pain. This is because one would have expected higher levels of DTA among participants who were under increased cognitive load in the event that thoughts about having a heart attack led to a substantial suppression of death-related thoughts. In contrast, it appears that thinking about heart attacks does not lead to substantially different levels of implicit thoughts

concerning death when individuals are either under conditions of increased cognitive load or are given a subsequent distraction. This adds further weight to the explanation that participants in this study did not relate thinking about having a heart attack to their own personal health. In other words, the low DTA levels among either condition of participants who received a Heart Attack Salience task appear to indicate that these participants failed to find heart attacks to be self-relevant.

5.3.2 Content Analyses of the Salience Measure

As predicted, the content analyses results clearly demonstrated that thinking about heart attacks evoked substantially greater thoughts of death and survival (both in the number of death-related words used and the degree of focus on death and survival themes), greater negativity and a greater degree of threat among participants than thinking about dental pain. Additionally, there were no significant differences in any of these dimensions on the basis of the Suppression tasks. This is consistent with prior TMT research that has shown that people will always respond to an explicit mortality-related measure at a conscious level of awareness (e.g. Greenberg et al., 1994; Arndt et al., 1997; Greenberg et al., 2000). Taken together, these results indicate that thinking about having a heart attack results in increased thoughts of death and an increased focus on death and survival themes, irrespective of whether or not an individual is under cognitive strain. Given the DTA results reported above, these results also suggest that there is something unusual about the Heart Attack Salience task that made participants exempt themselves from the seeming death-relatedness of thinking about heart attacks.

Thinking about heart attacks also led to a deeper style of writing than thinking about dental pain, suggesting that heart attacks represent a more existentially-relevant concept than dental pain. This is interesting in view of the fact that most of the participants in this study were younger adults. Thinking about heart attacks may be especially threatening for younger adults as it may serve to undermine prevalent views that they may have about their own invulnerability (e.g. Jemmott et al., 1986; Avis et al., 1989; Wild et al., 2001; Taubman - Ben-Ari & Findler, 2005). Nonetheless, the lack of significant differences in DTA between those participants who were asked to think about having a heart attack and those who were asked to think about dental pain appears to suggest that these younger adults may have held

steadfast beliefs that heart attacks were not relevant to their own health. Taking these results together, the content analysis of the deep vs. shallow writing dimension would appear to suggest that younger adults in the Heart Attack Salience conditions responded to the open-ended questions with a greater orientation towards symbolic meaning than participants from the Control conditions.

5.3.3 Potential Word Frequency Effects in the Word Fragment Completion Task

Despite the above potential explanations, it is important to note that participants in the current study tended to favour certain completions of the potentially death-relevant word fragments, regardless of their group membership (see Table 5.3 in the Results Section above). In other words, certain word fragment completions were much more common than the next most common alternative, irrespective of whether or not a participant had received a Heart Attack Salience or Control task. Notably, the word fragment COFF_ _ was completed with the word "coffee" by 70 out of the 72 participants, SK_ _L was completed with the word "skill" by 55 participants, "GRA_ _" was completed with the word "grass" by 40 participants and "KI_ _ED" was completed with the word "killed" by 39 participants. When comparing these results to the word frequency data in Table 5.4 derived from Kilgarriff's (1996) word frequency analysis of the British National Corpus, it is evident that the words "coffee", "skill", "grass" and "killed" have notably higher frequencies per million than their respective death-related counterparts; "coffin", "skull" and "grave". Additionally, the lemma (or headword) "kill" has a distinctly higher frequency per one hundred million words than its death-neutral counterpart "kick".

Death Completion	Frequency	Death-Neutral Completion	Frequency
Buried (Bury)*	2,987	*Burned (Burn*)*	5,091
Dead	11, 341	*Dear*	4, 106
Grave	1, 740	*Grass*	4, 143
Killed (Kill)*	15, 620	*Kicked (Kick*)*	3, 539
Skull	1, 234	*Skill*	11, 423
Coffin	1, 241	*Coffee*	6, 614

*The frequencies of the word lemmas in parenthesis are reported for these word fragment completions.

Table 5.4: Word Frequencies per Million Derived from Kilgarriff (1996) for the Death Completions and Most Common Death-Neutral Completions for Word Fragments in the Word Fragment Completion Task

Following such marked differences in word frequencies per million between the death completions and participants' most common death-neutral completions of the word fragments in the word fragment completion task, it is possible that this favouritism in participants' responses related to a potential confounding influence of word frequency effects. In order to fully understand this potential confound in light of the current pattern of insignificant results, a brief discussion of the literature on word frequency effects is given below.

5.3.3a Word Frequency Effects

A long history of psycho-linguistic and neuroscience research has investigated the processes involved in word recognition and production. It is generally understood from this research that, following their initial selection and activation, the syntactic properties of words become available to people for later use (Schmitt, Meyer & Levelt, 1999). Within this literature, a plethora of studies involving lexical decision tasks (i.e. where participants are required to judge whether a string of letters constitutes a word or a non-word) have examined whether or not the potential frequency of words has an impact on word recognition and production. The majority of these studies have found that high frequency words are recognized faster and with higher accuracy than lower frequency words (e.g. DeLucia & Stagner, 1954; Richardson, 1976; Balota & Chumbley, 1984; Hino & Lupker, 1996; Hino & Lupker, 2000; Yap, Tse & Balota, 2009) and that high frequency words elicit substantially lower event-related potentials (ERPs) and pupillary movements than lower frequency

words (e.g. Raynor & Duffy, 1986; Hauk & Pulvermüller, 2004; Kuchinke, Võ, Hofmann & Jacobs, 2007; Scott, O'Donnell, Leuthold & Sereno, 2009). A similar pattern of findings has come from naming tasks, where participants are required to name a picture or a word that they are presented with as quickly and accurately as possible; i.e. higher frequency words tend to lead to faster reaction times and greater accuracy in naming (e.g. Forster & Chambers, 1973; Jescheniak & Levelt, 1994; Hino & Lupker, 1996; Hino & Lupker, 2000). These effects have been termed "word frequency effects" and the reliability of such effects has led to their establishment as an important variable for models of word recognition (e.g. Morton, 1969; Grainger & Jacobs, 1996; Perry, Ziegler & Zorzi, 2007).

Some studies within this word frequency literature have investigated the interaction between word frequency and the emotional-arousing attributes of certain words. An early study by DeLucia & Stagner (1954) in this area demonstrated that word-recognition time was affected by both the frequency of usage of the word and its emotion-arousing value. An important later study by Kitiyama (1990) found that participants who had words flashed briefly before them on a screen were less accurate in their perceptions of low frequency words if the words were highly affective compared to low frequency words that were neutral, but that the affectiveness of words did not influence the accuracy of their perceptions of highly frequent words. More recently, the focus of these studies has turned towards the valence of emotionality in word recognition and perception. Kuchinke et al. (2007) found evidence from both reaction times and pupillary response data to suggest that their participants responded more rapidly to low frequency words that were either positively or negatively valenced than low frequency words that were neutral. These researchers also found that participants responded faster to positively valenced high frequency words than either negatively valenced or neutral high frequency words. Scott et al. (2009) replicated the above finding with both behavioural evidence from reaction time data and electrophysiological responses data in the form of event-related potentials (ERPs). Similarly, Méndez-Bértolo, Pozo & Hinojosa (2011) found that their participants exhibited slower reaction times and ERPs to low frequency words with negative emotional connotations than emotionally-neutral low frequency words but that there were no noticeable differences in participants' responses towards either emotionally-negative or emotionally-neutral high frequency words. Despite this

strong and pervasive pattern of interaction between word frequency and the emotionality of words, these studies have tended to find that people discriminate high frequency words faster than low frequency words, irrespective of their emotional valence (Kuchinke et al., 2007; Scott et al., 2009; Méndez-Bértolo et al., 2011).

In the context of word fragment completion tasks, a wealth of studies have also identified that low frequency words that are explicitly presented to participants in word lists prior to performing such tasks tend to prime better performance towards the task than higher frequency words (e.g. MacLeod, 1989; MacLeod & Kampe, 1996; Gomez, 2002; Soler, Ruiz & Dasí, 2002). Additionally, initially presenting participants with low frequency words within a text, which either appear to be out-of-context or are perceptually highlighted (e.g. presenting such words in upper-case or within a perceptually difficult-to-read context where spaces between words are replaced with numbers), leads to greater priming in their responses to word fragment completion tasks when they are compared to the responses of participants who are initially presented with higher frequency words under analogous conditions (e.g. MacLeod, 1989; Nicolas, Carbonnel & Tiberghien, 1994; Nicolas, 1998; Nicolas & Söderlund, 2000). This pattern of results suggested that high frequency words produced relatively small explicit priming effects. This is presumably because participants in these studies already had a large amount of available information stored about these items in their memories, whereas there may have been a smaller amount of information available to them concerning the low frequency words (Soler et al., 2002).

5.3.3b Word Frequency and Word Ambiguity Effects in the Current Study

As hinted at above, the favouritism in participants' responses to certain word fragment completions in the current study may have related to a potential confounding influence of word frequency effects. This is because participants may have completed certain word fragments as high frequency words, irrespective of whether or not they had been primed with mortality-related concerns. For instance, the high processing capacity required for participants in the study to produce a lower frequency word such as "coffin" might have made them less likely to complete the word fragment "COFF_ _" in such a fashion. Instead, these participants may have favoured the word fragment completion "coffee" due to its higher word frequency.

Similarly, a participant might have been more likely to complete the ambiguous word fragment "SK_ _L" with the high frequency word "skill" than with the relatively lower frequency word "skull". In contrast, participants may have more readily completed the word fragment "KI_ _ED" with the word "killed" rather than the word "kicked" due to the former word's higher word frequency. Finally, participants may have completed the word fragment "GRA_ _" more often with the word "grass" than with the lower frequency word "grave".

Some of the psycho-linguistic and neuroscience literature mentioned earlier would tend to support the suggestion that this favouritism in participants' responses in the current study was a consequence of word frequency effects in participants' responses. In particular, the findings that higher frequency words tend to be perceived and produced much faster and more accurately than low frequency words (e.g. Hino & Lupker, 2000; Hauk & Pulvermüller, 2004; Yap et al., 2009) and that people tend to discriminate high frequency words faster than low frequency words, irrespective of their emotional valence (e.g. Kuchinke et al., 2007; Scott et al., 2009; Méndez-Bértolo et al., 2011) lends support to the idea that participants may have been more likely to perceive and reproduce high frequency words than death-relevant words in the current study, irrespective of their group membership. In this way, the confounding influence of word frequency may have undermined the potential for participants' responses to the word fragment completion task to account for their level of DTA in this study. The implications of these findings for the wider DTA literature are further discussed in Chapter 7.

It is important to note that the inverse pattern of word frequency effects relating to the explicit priming of words discussed earlier (i.e. MacLeod, 1989; Nicolas et al., 1994; MacLeod & Kampe, 1996; Nicolas, 1998; Nicolas & Söderlund, 2000; Gomez, 2002; Soler et al., 2002) may be less relevant to the version of the word fragment completion task used in the current study than the pattern of word frequency effects from the studies relating to item generation and recognition mentioned above. This is because participants in the current study were either asked to write about heart attacks or dental pain before completing the word fragment completion task but were not explicitly primed with any of the target words in the word completion task such as *coffin*, *buried* or *skull*. Additionally, while the answers that participants wrote in

response to the Heart Attack Salience measure often contained such target words, these words tended to be embedded within the text in subtle ways. Subtle incorporations of target words within a text have not been found to lead to significant priming effects on word fragment completions in this way (e.g. MacLeod, 1989; Nicolas et al., 1994; Masson & MacLeod, 2000), possibly because such words are not as perceptually distinct to people as they may be in a priming task where the words are presented explicitly in word lists or in a perceptually distinct context prior to the completion of word fragment completion tasks. In contrast, studies that have found the prior presentation of low frequency words to lead to better performance of participants' responses to word fragment completion tasks compared to the prior presentation of high frequency words (e.g. MacLeod, 1989; Nicolas et al., 1994; MacLeod & Kampe, 1996; Nicolas, 1998; Nicolas & Söderlund, 2000; Gomez, 2002; Soler et al., 2002) have typically drawn participants' attention to target words. Consequently, it appears more likely that the inverse pattern of word frequency effects relating to item generation and recognition may be more relevant to the current study, where participants were more likely to have generated or recognized the target words themselves when completing this task rather than either explicitly or implicitly referring word fragments back to primed words.

In addition to the potential word frequency effects in the current study that are mentioned above, a couple of the purportedly death-related word fragment completions could be regarded as relatively ambiguous with respect to their relatedness to existential concepts such as death and mortality. In other words, these word fragments that were meant to illustrate death-related thoughts could have been interpreted in ways that are not specifically death or mortality-related. For instance, the word fragment completion "grave" for the word fragment "GRA_ _" could be interpreted as referring to the adjective, which means "serious or important", rather than the noun, which means "an excavation in the earth in which to bury a dead body". Since the adjective form is quite similar in frequency to the latter noun form, according to Kilgarriff's (1996) word frequency database (1, 138 and 1, 740 occurrences per one hundred million words respectively), it is difficult to rule out whether or not participants who selected this word fragment completion were referring to the death-neutral adjective or the death-related noun. In a similar fashion, the meaning of the word completion "buried" is not necessarily specifically related to

mortality or death-related concerns. This is because the verb "to bury" does not necessarily specifically refer to a death-related subject matter and may instead refer to a death-neutral activity (e.g. "The dog buried the toy I gave him in the back garden"). Additional instances of such word ambiguities in alternative DTA word fragment completion tasks and their implications are discussed further in Chapter 7.

It is also worth noting that it is less likely that the word fragment "DE_ _" had the same confounding influence of word frequency or word ambiguity as the above-mentioned word fragments. This is because this word fragment has potential death-neutral and death-related word fragment completions that are reasonably comparable with respect to their word frequency and "dead" is quite clearly a word that has a specific relation to mortality. That is to say, this word fragment is probably a suitable word fragment as it can be completed with either the specifically death-related word "dead" or the death-neutral word "deal"; both of these words having word frequencies that are quite close [11, 341 and 12, 067 occurrences per one hundred million words respectively, as reported in Kilgarriff's (1996) word frequency database].

5.3.4 Conclusion

To conclude, the results of Study 3 in the current research programme revealed no significant differences in DTA levels between participants who were either given a Heart Attack Salience or control task under conditions of increased cognitive load or participants who were given a Heart Attack Salience or Control task and subsequently distracted. These results suggest that it is unlikely that the lack of significant differences between the Heart Attack Salience and Control conditions in the first two studies of the research programme resulted from the continued suppression of death-related thoughts among participants in the Heart Attack Salience conditions after they were given a distraction task. Additionally, the content analyses of the salience measure revealed that thinking about having a heart attack led participants to elicit significantly more death-related thoughts compared to participants who were asked to think about the control topic of dental pain. These latter results suggest that Heart Attack Salience is a valid measure of priming death-related thoughts in participants. However, by the logic of TMT authors, the low DTA levels exhibited by participants who received the Heart Attack Salience measure appears to indicate that participants in the current study failed to find heart attacks to be existentially threatening. As

discussed above, this lack of existential threat among participants may have arisen because Heart Attack Salience somehow circumvents the normal TMT suppression process of increased implicit thoughts of death. For instance, participants may have minimised the importance and relevance of heart attacks to their own health, following previous research on CVD denial and self-exemption (e.g. Avis et al., 1989; Croyle et al., 1993; Mengden et al., 1998; Newell et al., 1999; Van Steenkiste et al., 2004; Peretti-Watel et al., 2007; Huerta et al., 2009). Nonetheless, these results should be treated with caution as the current study also revealed that the standard instrument in the TMT literature for the measurement of DTA (the word fragment completion task) may be confounded by the effects of word frequency and word ambiguity.

Chapter 6: Study 4

The results of the first two studies demonstrated that neither a cohort of participants aged over 55 years nor a cohort of participants aged 40-55 years displayed significant differences between the experimental and control conditions in their attitudes and behavioural intentions towards the CVD Risk Biochip and commitment towards its use. Specifically, there had been no differences on these dimensions between participants who received a Mortality Salience task, a Heart Attack Salience task or a Control task and subsequent distraction. Additionally, the results of the third study found no significant differences in DTA between participants who were given Heart Attack Salience or a control topic to complete and subsequently either distracted or put under conditions of increased cognitive load. Although there was the possibility that word frequency and word ambiguity effects in the word fragment completion task had an influence on the results of this latter study, they appear to suggest that there may be something about the Heart Attack Salience methodology that is not necessarily as existentially-threatening as either Cancer Salience or Mortality Salience itself. This is because the results of the third study depart from previous TMT research which found that there were significant differences in death-thought accessibility between participants from both Cancer Salience and Mortality Salience conditions compared to controls (e.g. Greenberg et al., 1994; Arndt et al., 1997; Greenberg et al., 2000; Arndt et al., 2007). Nonetheless, while neither Mortality Salience nor Heart Attack Salience may lead to defensive avoidance of health threat detection behaviours like using the CVD Risk Biochip when participants are in a distal mode of defence, there is the possibility that one of the alternative methodologies that TMT authors have used to induce distal defences in participants may lead to such patterns of behaviour. The fourth and final study in the current research programme was developed in order to test this proposition.

Perhaps the most common alternative to Mortality Salience that has emerged in the TMT literature is the "creaturely" methodology developed by Goldenberg et al. (2001). As mentioned earlier (see Chapter 1, page 1-22), this methodology involves getting participants to think about the creaturely aspects of being human rather than getting them to think about their own death or what would happen to them if they

were to develop a potentially fatal condition. The control group used with this procedure involves asking participants to think about the uniqueness of humans as compared to other animals; an alteration designed to provide a more direct comparison to the experimental condition. Goldenberg (2005) has suggested that the logic behind using this method is that an awareness of the physical body has the capacity to remind us that we are mere mortal beings that are similar to animals in our physicality and basic urges; an awareness that has the capacity to make us more vulnerable to the effects of existential anxiety. The resultant "Creatureliness Prime" methodology has been found to obtain analogous effects to Mortality Salience and a distraction in several TMT studies (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Cox et al., 2007; Goldenberg et al., 2008). For instance, Goldenberg et al. (2002) found that creaturely reminders and a subsequent distraction led to a decreased interest in the physical but not the romantic aspects of sex among participants compared to a control group in a similar fashion to previous TMT research by Goldenberg et al. (1999) which had found analogous results with the use of Mortality Salience and a distraction instead of a creaturely reminder.

More recent research has begun to suggest that the human creatureliness construct may be particularly relevant to health-orienting behaviours that involve a degree of confrontation with the human body. Importantly, Goldenberg & Arndt (2008) suggest that such creaturely reminders that are below conscious awareness can inform the health behaviours one chooses to adopt as a distal defence measure (i.e. as a way of preventing mortality reminders from entering a person's conscious awareness). More specifically, the third proposition of Goldenberg & Arndt's (2008) TMHM suggests that, when the physical or creaturely aspects of humans are primed and these mortality reminders are below conscious awareness, an individual will seek to engage in health behaviours that are less bodily-oriented (e.g. health screenings) in order to avoid the potential for these behaviours to remind the individual of their own creaturely nature. In this regard, Goldenberg et al. (2008) found in two of their studies that participants who thought about the creaturely aspects of being human exhibited significantly greater avoidant responses towards breast self-exams (in both real and imagined contexts) than control participants. Since breast self-exams involve a very personal and private confrontation with both the physicality of the human body and its capacity for developing a life-threatening condition, it is easy to appreciate the

potential for such behaviours to represent mortality reminders. Goldenberg et al. (2008) suggest that priming the creatureliness of the human body led their participants to exhibit more avoidant responses to breast self-exams due to the explicit activation of concepts relating to confrontation with the human body that creaturely reminders tend to provide. In a similar fashion, Goldenberg et al. (2009) found that a Creatureliness Prime in combination with Mortality Salience led women who were high in neuroticism (as measured by their high scores on the Neuroticism subscale of the Eysenck Personality Inventory) to report reduced willingness to undergo a mammogram. They suggested that the combination of these mortality reminders led these participants to exhibit such avoidant responses towards mammograms because the priming of both their mortality and their physicality made them particularly concerned with the possibility of receiving a cancer diagnosis and made them uncomfortable with the potential of the procedure itself to provide further confrontation with the physicality of their bodies.

In line with these ideas, it is possible that existential concerns relating to the creaturely qualities of the human body may constitute a greater barrier to disease-detection behaviours than Mortality Salience or Heart Attack Salience. More specifically in relation to the current research programme, this may mean that thinking about the creaturely aspects of being human would lead to more avoidant responses towards the CVD Risk Biochip as a Creatureliness Prime of this nature may be more specifically related to thoughts of using the device. This is because this particular device would make one confront the physicality of the human body by requiring a small pinprick of blood to be drawn. Additionally, as with breast-self exams, this focus on the physicality of the human body is accompanied by a bodily search, in this case of a more microscopic nature through the analysis of blood samples, for a potentially life-threatening condition. In other words, thinking about the creaturely aspects of being human may be a more pervasive barrier to the use of the CVD Risk Biochip than Mortality Salience or Heart Attack Salience because it may explicitly illuminate the potential frailty of the human body in the context of the use of the device. The use of the device itself also draws one's attention towards both the mortal process of bleeding and the possibility that one may develop CVD. Following this logic, one of the principal reasons for conducting the current study was to investigate whether or not priming participants to think about the creaturely aspects

of being human would lead to more avoidant responses towards the CVD Risk Biochip than participants who were primed to think about the unique aspects of being human. In this way, the study examined another facet of TMT in order to investigate if this alternative type of mortality reminder would lead to distal defensive avoidance towards the device among participants.

In addition to this change in the manner in which participants were to think about existential issues, the current study incorporated an examination of whether or not state self-esteem would have an effect on participants' responses towards the CVD Risk Biochip. As outlined in Chapter 2 (page 1-16), the *Anxiety-Buffer Hypothesis* suggests that the experience of high state self-esteem can provide a buffer to the effects of existential anxiety, whereas the experience of low state self-esteem can make one more vulnerable to the effects of existential anxiety; a suggestion that has been supported by a wealth of research on the topic (e.g. Greenberg et al., 1992b; Greenberg et al., 1993; Harmon-Jones et al., 1997; Van Den Boss, 2001; Hart et al., 2005; Schmeichel et al., 2009; Routledge et al., 2010). Following this prevalent finding in the TMT literature, it is possible that the lack of significant effects in the first two studies was partly as a result of a failure to control for self-esteem.

Self-esteem had been factored out of the design of these studies as they had been partly based on some of the analogous TMT studies relating to cancer-screening, which had not controlled for self-esteem (i.e. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). The authors of these cancer-screening studies thought that cancer was sufficiently existentially threatening to circumvent normal anxiety-buffering effects of having high self-esteem. However, it is possible that heart attacks were not sufficiently threatening to participants in the first two studies of the current programme in order to bypass the anxiety-buffering effects of high self-esteem. Because of this, the current study also included a method that has been used in previous TMT research by Routledge et al. (2010) as a way of experimentally manipulating high or low self-esteem among participants. By manipulating participants' self-esteem in this way, the study controlled for the possibility that high self-esteem may have moderated the effects of existential anxiety for participants in the first two studies.

The open-ended questions designed to threaten participants' self-esteem were also used as an alternative to Mortality Salience in this study. While, the previous TMT studies involving health threat detection behaviours that had used the Creatureliness Prime methodology had also included a Mortality Salience task (i.e. Goldenberg et al., 2008; Goldenberg et al., 2009), TMT suggests that undercutting an individual's self-esteem should lead to comparable TMT-related defences to Mortality Salience (e.g. Schimel et al., 2007; Hayes et al., 2008). Furthermore, a large body of TMT research has demonstrated that providing buffers to one's self-esteem can lead to a moderation of TMT-related effects such as worldview defence and self-esteem striving (e.g. Greenberg et al., 1992b; Greenberg et al., 1993; Harmon-Jones et al., 1997; Mikulincer & Florian, 2002; Schmeichel et al., 2009). It would appear to logically follow that undercutting an individual's self-esteem should lead to increased mortality-related concerns in a comparable fashion to Mortality Salience. In support of this proposition, recent TMT research has even found that threatening self-esteem experimentally can cause thoughts of death to become more accessible to people (e.g. Hayes et al., 2008; Routledge et al., 2010); suggesting that blows to one's self-esteem are equivalent to non-conscious mortality reminders in the sense that they tend to lead to an increase in the accessibility of death-related concepts. It has also been found that deficits to self-esteem such as neuroticism or depression can lead to increased TMT-related effects such as more vigorous worldview defence or avoidance of body-related stimuli (e.g. Simon, Greenberg, Harmon-Jones, Solomon & Pyszczynski, 1996; Goldenberg et al., 1999; Goldenberg et al., 2009). Even more pertinently, there is evidence that self-esteem deficits can result in the avoidance of health-orienting behaviours when people are in a distal mode of defence (e.g. Goldenberg et al., 2009). Furthermore, the TMHM predicts that self-esteem should be particularly relevant to individuals when they are in a distal mode of defence (Goldenberg & Arndt, 2009). In this way, threatening an individual's self-esteem could be seen to be analogous to presenting participants with mortality reminders when they are in a distal mode of defence. Consequently, it was hypothesised that threatening an individual's self-esteem would lead them to be more defensively avoidant of the CVD Risk Biochip as a way of protecting themselves against the potential of receiving a further blow to their self-esteem at the thought of using such a device (i.e. due to the potential for such a device to furnish one with a threatening health status).

As an alternative to the hypothesised TMT effects described above, the current study also included an exploration of the possibility that the nature of the CVD Risk Biochip itself could promote feelings of disembodiment or dissociation towards the risk information that it seeks to provide, thereby effectively resulting in a diminished response of existential anxiety towards the device. This suggestion is based on ideas from philosophy and sociology that suggest that technological devices like the CVD Risk Biochip that predict the future through abstractions (i.e. by using an abstract representation of CVD risk on a digital screen) tend to appear intangible and disembodied to the normal subject, leading to more ambivalent and "cool" responses towards them (e.g. Baudrillard, 1995; Prior et al., 2002). The following section will expand on these ideas for the purposes of providing a background to this particular research question. In order to examine this subject, it is first necessary to examine the perspective of the body that is employed through a biomedical lens.

6.0.1 The View of the Body in Medicine and the "Hyper-reality" of Diagnostic Technology

The origins of the dominant externalist view of the human body that may be found in modern medicine is often attributed to the writings of René Descartes; a sixteenth century French philosopher who has been regarded as the "philosophical father of modern medicine" (e.g. Leder, 1992, p.19). Descartes suggested that bodily sensations are not something of which we are aware in a conscious sense but that we "feel them" indirectly. He therefore separated bodily sensations from the perceptual faculties and conscious intellect (the latter of which he considered to be distinct from phenomenal experience). In this way, Descartes proposed that our subjectivity and sense of our "selves" are distinct from our physical experiences and that each is governed by processes and laws that remain separate from each other. This conception of a split between mental and physical life became known as "Cartesian Dualism" and paved the way for the growth of biomedical scientific investigation by allowing scholars to conceive of the body as subject to the mechanistic laws of causality, much like other components of the physical world. Furthermore, this view of the body became the dominant perspective in the treatment of illness; focusing on the "curing" of pathological "symptoms" by physico-chemical means. Sachs (1995) has pointed towards the fact that medical discourse has perpetuated this conception of the body as matter that can be transformed through purely material means. For

instance, medical practitioners emphasize that “a healthy body” can be achieved through eating less fat, drinking less alcohol, reducing smoking, increasing exercise, etc.

The current use of medical technologies that produce images of the body can also be seen to perpetuate the Cartesian dualist split, where the patient's "self" is distinguished from their "body-as-object" in medical settings. The images that are produced in these settings such as x-rays, ultrasounds, digital monitors or machine readouts have served to make the body a materially separate entity from the subject that inhabits it by providing a context where the body is visually objectified. Moreover, diagnostic practice has increasingly begun to focus on these sorts of images as a mediator for the interactions between doctors and patients. The images themselves are also generally regarded as “objective indicators” of disease or illness as compared to patients’ subjective experiences (e.g. Martínez, 2005; Blaxter, 2009). Furthermore, some qualitative research has found that there is a culture among medical practitioners of using dehumanizing and desubjectifying language with respect to their patients, whereby the patients are discussed as “bodies” that are either sick or healthy (e.g. Shaw, 2003). As extensively documented by the famous philosopher and social theorist Michel Foucault (e.g. 1975; 1977), the “clinical gaze” and categorisations of illness brought about through medical expertise in such ways are often used strategically as a power structure from which to control “bodies” (for a thorough account of the implications of this perspective see Lupton, 1997). In this regard, Foucault suggested that the view of the body-as-object often functions in medical contexts as a means to manipulate, shape and train bodies in order that they may be “disciplined”; a way of displacing the power that an individual may have over his/her own body into an “aptitude” that may be controlled from outside rather than from within (e.g. 1977). Such formulations reconstruct the very determinants of what it means to have a body by introducing pragmatic and instrumentalist concerns, while further re-constituting bodies and body parts through medical discourse (Lupton, 1997).

Processes of assessment, identification and treatment according to images of the body also lead to an increasing biomedicalisation of patients by medical professionals (Salter et al., 2011). In other words, the new “ways of seeing” that the adoption of

modern imaging techniques employ can serve to introduce new categories that are inherently structured by the screen images, stained samples or machine readouts themselves (Ihde, 2001). It has even been suggested that the patients themselves have started to become "virtual" in these emerging contexts or have started to disappear behind the screens, medical images and bodily constructions employed by medical practitioners as the medical discourse and language associated with the use of such technology becomes increasingly abstract and technical (Blaxter, 2009). MacLachlan (2004) provides a salient practical example of this in his anecdote of a nurse in a private ward in a Dublin hospital who was observed to walk into a patient's room, check the screens, bed-side monitors and charts on each side before promptly exiting, while the patient called after her "Hey, I'm fine too!"

In addition to the disassociating effects of such biomedical images for the layperson, Prior et al. (2002) have argued that certain aspects of diagnostic measurement may appear "unnatural" to them. For instance, the staining processes and electronic readers used in diagnostic technology tend to divert patient's attention away from their bodily processes in such a way that the risk measurement procedures associated with these instruments often appear to be less imminently related to their bodies. Diagnostic risk estimates are also often based on statistical models that are linked to probabilities gleaned from incidence surveys pertaining to a particular illness or disease and such abstract risk information can seem intangible to the patient (Prior et al., 2002). Indeed, these models are often composed of abstract signs, symbols and equations that seem less tangible or less rooted in a person's normal experiences of their bodies. The abstraction and intangibility of these symbolic future projections of illnesses bear a strong resemblance to some of the characteristics of the "third order of simulation" identified by the poststructuralist philosopher Jean Baudrillard.

Baudrillard (e.g. 1983; 1995; 2000) has depicted his vision of a "third order of simulation" as those simulations which are produced by models of the real world and precede an event occurring, thereby creating a prescription of "reality" that is worked out and constructed ahead of time. He noted that the existence of this third type of simulation produces a social effect where there is a blurring of the lines between *what is to be experienced* and *what is experienced*. In other words, there is no longer a clear dividing line that clearly separates an experience and the anticipation of the

experience relating to such simulations for the subject who engages with them. This can clearly be seen to relate to technologies that are designed to predict future consequences that may have little clear relations to a subject's present experiences. Due to this confusing lack of a clear delineation between what is real and what is predicted, the subject is led to regard such simulations in more emotionally detached, disconnected or "cool" ways than more tangible experiences that they may have had that are firmly rooted in reality. Furthermore, the "reality" of engaging in such simulations is similarly experienced in this cool and detached manner due to the blurring boundaries between what constitutes the model and what constitutes "the reality". Baudrillard further described the resulting deconstruction of authenticity for the subject as the experience of a "hyper-reality"; "the product of an irradiating synthesis of combinatory models in a hyperspace without atmosphere" (1995, p. 2).

6.0.2 Potential Mediating or Disembodying Effects of the CVD Risk Biochip

Relating some of the above ideas back to the current programme of research, the CVD Risk Biochip can easily be recognised as a simulation of the third order. This is because it is a computerised technology that serves as a model of a possible future reality; one which indicates a person's likelihood of developing CVD through the abstract representation of CVD risk through numbers on a digital screen. Although the device uses a drop of the patient's blood in its measurement procedure, thereby engendering a certain relation to the person's bodily experiences as described previously, it is arguable from this perspective that the main focus of this procedure is on the potential future reality that the device predicts. Indeed, irrespective of the use of a blood sample in the measurement procedure that may expose human creaturely vulnerabilities, the focus of this type of CVD risk measurement could be seen to relate more directly to the abstract information that the device produces. In this light, the individual who uses the CVD Risk Biochip may not experience the measurement itself in such a way that it is rooted in their normal experiences of the body, time, space and relations with other people. Instead, the individual's focus on the digital screen readings involved in using such a device may promote a more detached and disembodied experience of the measurement procedure, as the risk information is given as an abstract codified piece of information that suggests their risk with regard to a possible future that may be modifiable. In this way, the subject's encounter with the information derived from the CVD Risk Biochip may be experienced in a

detached way as “information to be processed” rather than as an imminent reality to be dealt with.

Following on from such ideas, it could be argued that the priming of existential concerns in the first two studies of the current programme did not have an impact on participant’s appraisal of the CVD Risk Biochip as the abstract description of the mechanism involved in the device and its potential lack of imminent relatedness to bodily processes experienced by a participant may have served to make the potential existential threat associated with its risk assessment for the development of CVD seem less genuine and more remote to them. This could also explain why participants in the first two studies of the current research programme did not display defensive avoidant responses towards the CVD Risk Biochip following mortality reminders and a distraction in contrast to previous TMT cancer-screening studies (e.g. Arndt et al., 2007; Goldenberg et al., 2008); participants in the first two studies may not have found the device to be intimately connected to their bodies. In order to establish whether this potential effect may have occurred in the first two studies it was therefore decided to assess whether or not all participants would experience a certain detached ambivalence or dissociation towards the risk information that the device provides.

6.0.3 The Current Study

In order to investigate if thinking about human creatureliness or the buffering and protective effects of self-esteem would have an impact on participants’ appraisal of the CVD Risk Biochip, the Creatureliness Prime and Self-Esteem task methodologies described by Goldenberg et al. (2001) and Routledge et al. (2010) respectively were incorporated into the design of the current study. Recruited participants were given a questionnaire booklet, which contained one of the Self-Esteem tasks (designed to either temporarily increase participants’ self-esteem or temporarily lower their self-esteem) followed by an essay to read concerning the creaturely aspects of being human or what is unique about being human and a standard TMT distraction task. These components of the questionnaires were followed by information regarding the CVD Risk Biochip, a measure of attitudes towards the device and two measures of participant’s intentions to use the device; each of which were adapted from the first two studies of the current programme.

In line with TMT, it was hypothesised that participants who were given the task to complete that was designed to lower their self-esteem would demonstrate more avoidant responses towards the device than participants who were given the task designed to boost their self-esteem (e.g. following Hayes et al., 2008; Routledge et al., 2010). Similarly, as per Goldenberg et al. (2008), it was predicted that participants who were primed to think about the creaturely qualities of humans and furnished with a subsequent distraction would demonstrate greater avoidant responses towards the CVD Risk Biochip than participants who were primed to think about human uniqueness and provided with the same distraction. Additionally, it was hypothesized that participants who received both the task that was designed to lower their self-esteem and the Creatureliness Prime would exhibit the most avoidant responses towards the device. This is because TMT research suggests that the receipt of an existential prime (in this case involving human creatureliness) in combination with a procedure which has been designed to undercut a protective structure against existential anxiety (in this case, the experimental lowering of self-esteem) should lead individuals to be particularly avoidant of threats to one's health and well-being and the confrontation of one's body that may accompany health-protective behaviours like the uptake of the CVD Risk Biochip (e.g. Goldenberg et al., 2005).

Near the end of the questionnaire, participants also received a measure of the extent to which the CVD Risk Biochip promoted feelings of disembodiment or dissociation towards their bodies (i.e. a scale involving the relatedness of the device to participants' bodily experiences). This measure was included in order to explore the alternative explanation to TMT described above that the device itself may have promoted feelings of disembodiment or dissociation towards CVD risk information among participants, thereby moderating existential concerns they may have had relating to the device. Accordingly, it was predicted from this perspective that participants would indicate that the information that the CVD Risk Biochip was purported to deliver could not be easily related to the general sense of health and well-being that they normally experienced from their bodies, particularly in the event that these participants did not exhibit avoidant responses towards the device in line with TMT. Additionally, since this hypothesis was designed to be an alternative explanation to TMT, it was predicted that there would be no significant differences between the groups on this dimension. In other words, this hypothesis suggested that,

irrespective of experimental condition, all participants would demonstrate strong feelings of disembodiment or dissociation towards the potential risk information that the device was purported to provide.

6.1 METHOD

6.1.1 Design

This study employed a 2 x 2 independent measures design as a function of a Self-Esteem task (Self-Esteem Threat vs. Self-Esteem Bolster) and an Existential Prime (Creatureliness Prime vs. Uniqueness Prime) that participants received. The questionnaire booklets were block randomised before presentation to participants in order to assure random assignment to the Self-Esteem Bolster / Creatureliness Prime, Self-Esteem Threat / Creatureliness Prime, Self-Esteem Bolster / Uniqueness Prime and Self-Esteem Threat / Uniqueness Prime conditions respectively. In line with the typically large effect sizes reported in previous TMT studies (Arndt & Vess, 2008), the study sought a sample size of 112 participants in preparation for a 2 x 2 x 2 between-subjects MANCOVA (14 participants per cell as per Cohen, 1992).

6.1.2 Participants

One hundred and twelve participants aged 40-55 volunteered to participate (42 males and 70 females). As with Study 2 in the current programme of research, this age range was selected as it roughly corresponds to the period of middle age; a stage in adult life that has been proposed to represent a point where people are particularly vulnerable to existential concerns (e.g. Becker, 1973; Erikson et al., 1986; Erikson & Erikson, 1997; Neimeyer et al., 2004; Taubman - Ben-Ari & Findler, 2005; Maxfield et al., 2007).

Approximately one third of those people who participated in the study were Dublin City University staff or postgraduate students who were recruited via e-mail contact through corresponding e-mail lists, where these potential participants were given general information concerning the study (See Appendix I1-I2 for the corresponding E-mail and Word Attachment Content). Specifically, this initial e-mail contact outlined that the study involved completing a questionnaire "concerning personal reactions towards various topics such as personal life experiences, aspects of health

and better ways of knowing about your health", that staff and postgraduates were eligible to take part if they were between 40-55 years of age, that completion of the questionnaire should take no more than 30 minutes and that all information given in the questionnaire would remain completely anonymous and confidential. Potential participants were also advised to contact the researcher if they were interested in participating in the study. After a staff or postgraduate member signified their interest in participating, the researcher subsequently arranged a suitable time for them to complete a questionnaire. Each of these participants then completed the questionnaire in a room in the Dublin City University School of Nursing and Human Sciences which was deemed to be a controlled environment where participants would be free from distractions. Dublin City University staff or postgraduate students who already had knowledge of the CVD Risk Biochip were deemed ineligible to participate.

The remainder of the participants were recruited via a snowball sampling method through the initial set of staff and postgraduate participants. More specifically, the researcher gave information leaflets (See Appendix H2 for a Sample Information Leaflet) to each participant after they had completed a questionnaire and requested for them to disseminate these leaflets to any of their acquaintances who might fit into the 40-55 age range. Following contact from those acquaintances of participants who indicated an interest in participating in the study, a suitable time and convenient location was subsequently arranged in order for them to complete a questionnaire booklet. When a controlled room in Dublin City University School of Nursing and Human Sciences was not deemed convenient to these participants, they completed the questionnaire in their own homes under the supervision of the researcher, who ensured that participants were not distracted and that each section of the questionnaire was completed in the order presented.

6.1.3 Procedure

Before completing one of the four Questionnaire Booklets (see Appendix F1-F4), participants read a Plain Language Statement and signed a Consent Form (see Appendix B4), where they indicated that they were satisfied with the information provided to them. They were then instructed to complete each section in the order presented and not to skip between sections. In this regard, their attention was explicitly drawn to the fact that the questions relating to the essay that they were to

read (i.e. the Existential Prime method derived from Goldenberg et al., 2001) did not immediately follow the essay itself.

Following these instructions, participants in the Self-Esteem Bolster conditions were given a Questionnaire Booklet which initially presented them with two open-ended questions that required them to describe a time in which they succeeded in living up to an important value. Contrastingly, those in the Self-Esteem Threat conditions were given an analogous set of open-ended questions which asked them to describe a time in which they failed to live up to an important value. Following this, participants from the Creatureliness Prime conditions read an essay that emphasised human creatureliness. Alternatively, participants from the Uniqueness Prime conditions read an essay that emphasised human uniqueness.

Participants from each of the experimental conditions then completed a TMT distraction task, consisting of a short word search puzzle, which was designed to remove mortality concerns from immediate awareness. Following this distraction, they were presented with the version of the information sheet relating to the CVD Risk Biochip that had been previously given to participants in Study 2 of the current research programme (i.e. the version which included the paragraph relating to middle aged risk in the development of CVD) and the measures of attitudes towards the device and intentions to use the device that were previously used in the first two studies of the programme. Finally, participants completed a novel questionnaire that measured the extent of their feelings of disembodiment and dissociation towards the CVD Risk Biochip (the CVD Risk Biochip Body-Relatedness Scale; the development of this scale is described below). Following completion of the Questionnaire Booklets (which took approximately 20 minutes), participants were debriefed about the full nature of the study and were given the opportunity to discuss any queries or concerns that they may have had in relation to the study. Each participant was also given a Debriefing Sheet (Appendix G4) which contained detailed information about the design, aims and objectives of the current study.

6.1.4 Materials

6.1.4a Self-Esteem task

Participants received a Questionnaire Booklet containing a set of two-open ended questions that were designed to either temporarily threaten or bolster their self-esteem (i.e. Self-Esteem Threat or Self-Esteem Bolster). This procedure had been previously used in TMT research by Routledge et al. (2010) in order to investigate the anxiety-buffering effects of self-esteem and was derived from prior research relating to "ego-deflation/ego-inflation" (e.g. Sedikides, Campbell, Reeder & Elliott, 1998; Gaertner, Sedikides & Graetz, 1999; Green, Sedikides & Gregg, 2008). The validity of this procedure as a measure of threatening self-esteem or boosting self-esteem had previously been established through the findings that participants who received the Self-Esteem Threat task to complete exhibited more negative self-appraisals and decreased mood while participants who received the Self-Esteem Bolster task exhibited more positive self-appraisals and enhanced mood (e.g. Green et al., 2008).

The task itself involved the completion of two open-ended questions concerning a great personal success or a great personal failure that participants may have experienced. Specifically, participants in the Self-Esteem Threat conditions were asked "Please briefly think about and describe a time in which you failed to live up to one of your most important values. That is, describe one of your greatest personal failures." and "How did this personal failure make you feel?" Correspondingly, participants in the Self-Esteem Bolster conditions were asked "Please briefly think about and describe a time in which you successfully lived up to one of your most important values. That is, describe one of your greatest personal successes." and "How did this personal success make you feel?"

6.1.4b Existential Prime

Participants also received one of two essays to read that either emphasised the similarity of humans to other animals or emphasised the uniqueness of humans as compared to other animals (i.e. a Creatureliness Prime or a Uniqueness Prime). This procedure was derived from Goldenberg et al. (2001) and had been specifically designed to emphasise either the similarity or difference between humans and other animals. The essay that emphasised the similarity between humans and other animals had also been used in several prior TMT studies relating to breast-cancer screening

and mammography as a way of drawing the attention of participants in those studies towards the creaturely nature of their own bodies; while the essay that emphasised the uniqueness of humans as compared to other animals had been used as a control topic in these studies (e.g. Goldenberg et al., 2008; Goldenberg et al., 2009). Participants from both conditions were informed that the essays had been written by honour students at the University of Missouri-St. Louis concerning "The most important thing you have learned about human nature". The students were also instructed to read the essay carefully as there would be questions relating to the essay at the end of the packet. The essay emphasising human creatureliness included the following lines:

> The boundary between humans and animals is not as great as most people think. Although we like to think that we are special and unique, our bodies work in pretty much the same way as the bodies of all other animals. Whether you're talking about lizards, cows, horses, insects, or humans, we're all made up of the same basic biological products. We're all made up of skin, blood, organs, and bones. We're all driven by needs for food, water, sex, and comfort. Although some people like to claim that we humans are vastly more intelligent than other animals, this doesn't really seem to be true. What appears to be the results of complex thought and free will is really just the result of our biological programming and simple learning experiences, just like all other animals. Research shows that chimps have the capacity for language; even pigeons are able to solve pretty complex problems, and all animals show caring for and attachment to their offspring. Human beings are just another species of animals, maybe a little more intelligent than others, but not different in any really important or meaningful way. Seeing ourselves as special or different from the cows we eat for lunch or the insects we wash off our windshields is just another example of human vanity and self-delusion.

In contrast, the essay emphasising human uniqueness contained the following lines:

> The one thing that my education has made clear to me is that, although we humans have some things in common with other animals, human beings are truly unique. Although our bodies may be pretty similar to simpler species, the potential of the human mind and spirit go far beyond anything remotely

similar to what is found in simple animals. First there are the obvious things: Humans have language and culture. We create works of art, music, and literature that enable us to live in an abstract world of the imagination -- something no other animal is capable of. Although simple animals may communicate with grunts and groans, and chimps can be taught basic sign language by humans, this is a far cry from the complex and inspiring works of human culture: Shakespeare, Beethoven, and Picasso, to name just a few. Unlike animals, humans live in a world of ideas and concepts, morals and values. We can even come to understand ourselves, as in the works of the great philosophers and psychologists. More importantly, humans have the capacity for love, generosity, and kindness ---- putting the welfare of others above themselves. We are not simple selfish creatures driven by hunger and lust, but complex individuals with a will of our own, capable of making choices, and creating our own destinies. Although we certainly have some things in common with simple animals, we humans are truly special and unique.

6.1.4c Distraction Task

As described in Chapter 2 (page 1-24), TMT research has established that distal defences are used by people as a means to actively avoid the reality of existential concerns when such concerns are below conscious awareness (e.g. Greenberg et al., 1994; Greenberg et al., 1999). Typically, TMT studies that have investigated distal defences have provided participants with a Distraction Task in order to allow conscious mortality concerns to subside before the dependent measures are introduced. The Distraction Task used in the current study involved a standard word search task that did not contain any death-related words. Similar word search tasks have been employed as a delay exercise between mortality-related methodologies and dependent variables in many previous TMT studies (e.g. Vess, Clay, Landau & Arndt, 2009).

6.1.4d CVD Risk Biochip Information Sheet & Attitude/Behavioural Intentions Measures

The CVD Risk Biochip Information Sheet used in the current study was the same version that was described in Study 2, which included the additional paragraph

highlighting the risk of developing CVD in both male and female middle-aged adults. As per Study 2, this version of the CVD Risk Biochip Information Sheet was used in order to ensure that middle-aged risk in the development of CVD was made relevant to participants. The CVD Risk Biochip Attitudes Scale, CVD Risk Biochip Behavioural Intention and De Facto Intentions Measure were the same measures that were used in the first two studies.

6.1.4e CVD Risk Biochip Body-Relatedness Scale

Participants also completed a novel questionnaire concerning the disembodiment and disassociation of technology. In the absence of an existing validated measure, this questionnaire was designed in order to measure the alternative hypothesis of the current study; i.e. that the thought of using the CVD Risk Biochip may be less existentially relevant than the thought of participating in other forms of disease detection such as cancer-screening as the device draws one's attention away from one's own body.

The items in the questionnaire were developed from focus group discussion, where a group of four participants were asked to give their thoughts about how technology might lead to a sense of disconnection and disassociation from one's body. Specifically, after several questions designed to generate discussion about technology and its relationship to the body, participants were given a definition of disembodiment as the feeling that "one's consciousness is disconnected from one's body" and were asked to discuss anything about technology in a general sense that they thought might relate to this definition. The participants were then asked to comment on the previously mentioned vignette that was drawn from MacLachlan (2004) concerning the relationship between medical practitioners and patients in a modern hospital setting:

> Recently a nurse walked into a patient's private room in a Dublin hospital, conscientiously and professionally checked the monitors above the bed and to each side of it, and strode towards the door; the patient, of whom these machines gave some impression, barked "Hey, I'm fine too!" (p. 139)

Following this, the participants were asked to comment on the suggestion from health psychology literature that continual developments in diagnostic technology have

contributed to a culture among medical practitioners whereby patients are discussed as conscious-less "bodies" that are either sick or healthy (e.g. Martínez, 2005; Blaxter, 2009). Finally, the participants were introduced to the CVD Risk Biochip and were encouraged to discuss how one might relate the risk information that the device is proposed to indicate to one's own bodily experiences.

The focus group was recorded via an Apple i-talk© hardware device, which constitutes a small microphone that can be attached to a standard Apple i-pod©. The subsequent recording was transcribed and the transcript was subject to a thematic analysis. From this thematic analysis, the following seven statements relating to the CVD Risk Biochip were derived:

1. *The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences.*
2. *Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.*
3. *Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body.*
4. *Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.*
5. *I would be sceptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.*
6. *Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.*
7. *Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.*

Prior to receiving these items in the questionnaire booklet, participants were asked to explicitly imagine using a technology like the CVD Risk Biochip. This procedure was employed as a way of controlling for hypothetical bias, following previous research which found that explicitly requesting an individual to imagine performing a target behaviour serves to remove overestimations of performing that behaviour in the future (e.g. Cummings & Taylor, 1999; Brown et al., 2003; Ajzen et al., 2004).

Specifically, participants were given the following passage to read prior to completing the above items:

> Diagnostic detection of risk factors for diseases like CVD is potentially becoming easier with technologies like the CVD Risk Biochip described earlier. Specifically, devices like the CVD Risk Biochip are being developed with a view to being used in the home as an indication for future risk of developing CVD. Try to clearly imagine what it might be like to use a technology like the CVD Risk Biochip yourself (for example, using the device in your own home) and answer the questions that follow. Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement. Please respond to them with your first, natural response.

Participants were then asked to rate their opinions of each of the items on a 5-point Likert scale, from 'strongly disagree' to 'strongly agree'.

6.1.4f Essay Evaluation

At the end of the questionnaire packet, participants were provided with six questions, which asked them to evaluate the essay that they had read emphasising the similarity or difference between humans and other animals. Specifically, participants were asked to respond to the following items on a 9-point Likert scale with 1 indicating a negative evaluation and 9 indicating a positive evaluation:

1. *How much do you think you would like this person?*
2. *How intelligent do you believe this person to be?*
3. *How knowledgeable do you believe this person to be?*
4. *Is this person's opinion well-informed?*
5. *How much do you agree with this person's opinion?*
6. *From your perspective, how true do you think this person's opinion is of the topic they discussed?*

This measure was included in order to assess the degree of positivity or negativity that participants expressed towards the authors of the essays. The principal purpose for such an assessment was to ensure that the Creatureliness Prime had elicited a threatening response among participants. Previous TMT research had used this

measure as a manipulation check in this way and had consistently established that the Creatureliness Prime elicited significantly more negative reactions among participants towards the authors of the essay than the Uniqueness Prime (e.g. Goldenberg et al., 1999; Goldenberg et al., 2002; Cox et al., 2007; Goldenberg et al., 2008). It should also be noted that participants had not been asked to evaluate the essay immediately after they had read it, as previous TMT research had demonstrated that being given the opportunity to affirm a viewpoint, e.g. by defending or derogating a person on an existentially-relevant topic, can serve to moderate feelings of existential anxiety (e.g. Schmeichel & Martens, 2005). Consequently, the questions relating to the essay were given to participants at the end of each Questionnaire Booklet, following the dependent variables, consistent with previous research (e.g. Goldenberg et al., 1999; Goldenberg et al., 2002; Cox et al., 2007; Goldenberg et al., 2008).

6.1.5 Ethical Issues

The principal ethical issues relating to the current study are outlined below. These issues were brought to the attention of the DCU Research Ethics Committee, who granted approval for the current study.

There were a couple of ethical issues that related to the current study that have already been addressed in previous chapters concerning some of the prior studies in the current research programme. Firstly, participants were unaware of the full nature of the current study but were given a full verbal debriefing about the purpose of the study, any deceptions used, and why they were needed to study the question at hand. Participants were also given the opportunity to ask any questions or raise any concerns that they may have had in relation to the current study and they were given a Debriefing Sheet to take away with them (See Appendix G4). Additionally, as with the second study in the current research programme, participants were provided with an amended CVD Risk Biochip Information Sheet that contained an indication of middle-aged risk for the development of CVD. Since this type of information is similar to the sort of information that is commonly provided in public media such as newspapers, magazines and documentaries, it was not considered to constitute a risk to participants that departed from normal everyday experiences.

One novel ethical concern that arose in the current study related to the concern that participants who were given the task to complete which asked them to describe a time when they failed to live up to an important value (i.e. the Self-Esteem Threat task) may have found the completion of this task to be distressing. However, it was reasoned that completion of this task did not constitute a substantial risk to participants as it is quite normal to encounter a situation where one is asked to describe such an experience to one's friends or family (e.g. where a friend has failed to live up to an important value and consequently requests one to recount a similar experience for reassurance purposes). Additionally, this methodology had been used in previous TMT research (e.g. Routledge et al., 2010), where participants did not find this task to be particularly distressing to complete. Nonetheless, in order to ensure that they were not distressed by completion of this task, participants were instructed in the Plain Language Statement and Consent Form that they were free to withdraw from the study at any time, without completing the questionnaire and without giving any reason for withdrawing should they feel unduly stressed by a particular question.

An additional ethical concern that arose in the current study related to the completion of the Creatureliness Prime. In this regard, it was conceived that reading about the creatureliness of humans might act as a trigger for anxiety or stress among individuals who felt opposed to the idea that humans have a creaturely nature. However, it may be noted that similar ideas are frequently discussed in newspapers and other forms of media (e.g. articles or documentaries that describe scientific research supporting a Darwinian perspective) and participants who were asked to think about human creatureliness in previous TMT that used this particular methodology did not indicate that they were particularly distressed or upset by the idea of human creatureliness (e.g. Goldenberg et al., 2001). Nevertheless, participants were given the opportunity to defend against this idea at the end of the questionnaire booklet, where they were given the Essay Evaluation which asked them to evaluate the essay that they had read. The process of answering this set of questions may have alleviated any of the stress or anxiety brought on by considering the subject of the similarity of humans to other animals. Following the above ideas, it may be concluded that getting participants to think about such ideas did not constitute a risk to them that was greater than those encountered in everyday life.

6.1.6 Data Analyses

6.1.6a MANCOVA and Logistic Regression

As with the first and second studies in the current research programme, a MANCOVA was planned for the attitudes and behavioural intentions data as the dependent variables with gender as a covariate in order to assess if there were differences in the participants' positive or negative appraisal of the CVD Risk Biochip as a function of their experimental condition. As with the first two studies, gender was included as a covariate in order to control for the possibility that participants' attitudes and behavioural intentions towards the CVD Risk Biochip may have arisen due to gender differences in health-oriented and health-seeking behaviours (e.g. Tamres et al., 2002; Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004; Lynn et al., 2009). The MANCOVA for the current study was planned as a 2 x 2 analysis as a function of the Existential Primes and Self-Esteem task that participants received. Similarly, a logistic regression was planned with the De Facto Intentions Measure as a dependent variable and Existential Prime, Self-Esteem task and gender included as predictors in order to investigate if a participant's gender or assignment to one of the four experimental groups would help to predict the odds of whether or not they chose to sign up for the CVD Risk Biochip pilot study.

6.1.6b ANCOVA

A 2 (Existential Prime) x 2 (Self-Esteem) ANCOVA was also planned for the data from the CVD Risk Biochip Body-relatedness scale with gender as a covariate in order to determine whether or not receipt of either one of the Existential Primes or one of the Self-Esteem tasks would lead to differing appraisals of how much participants considered the proposed risk information to be derived from the CVD Risk Biochip to relate to their own sense of health and well-being from their bodies. Since the hypothesis relating to this data suggested that, regardless of the experimental condition to which they were assigned, each participant would demonstrate strong feelings of disembodiment or dissociation towards the risk information that the device was purported to provide, this ANCOVA was designed to test whether or not there were significant differences between the conditions on their responses towards the CVD Risk Biochip Body-relatedness scale items. A decision was made to conduct this analysis separately from the MANCOVA analysis for two principal reasons. Firstly, the items on this scale were deemed to represent a construct

that was significantly qualitatively different to the attitudes and behavioural intentions data. Additionally, the construction of these items was carried out in order to test the alternative hypothesis that the information that the CVD Risk Biochip was purported to deliver could not be easily related to the general sense of health and well-being that they normally experienced from their bodies; a hypothesis that was itself deemed to be qualitatively different from the hypothesis relating to the CVD Risk Biochip Attitude and Behavioural Intentions Scales. Gender was also included as a covariate in this analysis in order to control for the possibility that females may have exhibited different responses on this measure depending on which Self-Esteem task they received. This is because previous research has found that women's self-esteem is often heavily influenced by their sense of body satisfaction (for a review of such ideas, see Hesse-Biber, Leavy, Quinn & Zoino, 2006); meaning that women whose self-esteem was threatened could have been more defensively avoidant of the relatedness of the CVD Risk Biochip information to their own bodies.

6.1.6c ANOVA

An additional 2 (Existential Prime) x 2 (Self-Esteem) ANOVA was also conducted on the Essay Evaluation questionnaire. This was planned in order to check that the creatureliness essay was perceived more negatively by participants than the uniqueness essay, following previous TMT research (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Cox et al., 2007).

6.2 RESULTS

6.2.1 Sample Characteristics

The sample consisted of 42 males (37.5%) and 70 females (62.5%) between 40-55 years of age (M = 46.9, SD = 4.52; with 12 missing values) who volunteered to participate.

6.2.2 Descriptive Statistics

All items from the CVD Risk Biochip Attitude and the CVD Risk Biochip Behavioural Intentions scales that were negatively phrased had their scores reversed so that all of the values reflected the same 5-point Likert scale, from 1 = highly negative to 5 = highly positive. In a similar fashion, items pertaining to the CVD Risk

Biochip Body-Relatedness Scale were also scored on a 5-point Likert scale which asked participants to indicate how much they agreed with a series of statements concerning the relatedness of the CVD Risk Biochip to their bodies. These items were re-scored where necessary in order to achieve a series of items that represented a range of scores from 1 = not at all body-related to 5 = highly body-related with respect to the CVD Risk Biochip. Tables 6.1-6.3 provide means and standard deviations (reflecting the re-scored values of participant's responses to the individual items on these scales).

	Uniqueness Prime				*Creatureliness Prime*					
	Self Esteem Bolster		***Self Esteem Threat***		***Self Esteem Bolster***		***Self Esteem Threat***		***Total***	
Item	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. The CVD Risk Biochip is an exciting new device.	4.36	0.78	4.64	0.56	4.25	0.89	4.32	0.67	4.39	0.74
2. Diagnostic testing should be left to the professionals.	2.89	1.32	3.11	1.29	3.07	1.25	2.68	1.12	2.94	1.24
3. The CVD Risk Biochip makes me feel empowered about my health.	3.79	1.10	3.93	0.60	3.64	1.19	3.57	1.03	3.73	1.00
4. The CVD Risk Biochip will only serve to frighten people about their health.	4.07	0.98	3.89	1.07	3.86	0.97	3.82	1.09	3.91	1.02
5. The CVD Risk Biochip is a valuable new device.	4.32	0.77	4.54	0.51	4.25	0.80	4.11	0.88	4.30	0.76
6. Moving diagnostic testing from hospital settings to the home is a great idea.	3.82	0.98	3.86	1.15	3.71	1.15	3.82	1.22	3.80	1.11
7. The CVD Risk Biochip makes me feel anxious.	3.96	1.14	4.32	0.91	3.82	1.16	4.18	1.06	4.07	1.07
8. The CVD Risk Biochip will encourage people to take a more active approach to their health.	4.11	0.79	4.11	0.99	3.89	1.20	4.04	0.92	4.04	0.98
9. The CVD Risk Biochip is an unnecessary device.	4.32	0.77	4.36	0.83	4.25	0.89	4.18	0.95	4.28	0.85

Table 6.1: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Attitude Scale by Existential Prime and Self-Esteem (Re-scored Values)

	Uniqueness Prime				*Creatureliness Prime*					
	Self Esteem Bolster		***Self Esteem Threat***		***Self Esteem Bolster***		***Self Esteem Threat***		***Total***	
Item	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.	3.25	1.15	3.21	1.26	3.11	1.50	3.18	1.31	3.19	1.37
2. If my GP recommended that I use this device, it is highly likely that I would use it.	4.39	0.92	4.39	0.57	4.18	1.06	4.18	1.02	4.29	0.91
3. The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.	3.39	1.17	3.68	1.06	3.36	1.25	3.46	1.32	3.47	1.19
4. At this moment, I feel particularly motivated to use the CVD Risk Biochip.	3.11	1.26	3.00	1.41	2.68	1.42	2.71	1.41	2.88	1.37
5. At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.	3.57	1.23	3.86	1.01	3.54	1.20	3.61	1.17	3.64	1.15
6. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.	3.82	1.19	4.18	0.91	3.96	1.23	3.89	1.23	3.96	1.14

Table 6.2: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Behavioural Intentions Scale by Condition Existential Prime and Self-Esteem (Re-scored Values)

	Uniqueness Prime				***Creatureliness Prime***					
	Self Esteem Bolster		***Self Esteem Threat***		***Self Esteem Bolster***		***Self Esteem Threat***		***Total***	
Item	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
1. The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences.	3.39	1.23	3.64	1.16	3.36	1.06	3.21	1.07	3.40	1.13
2. Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.	4.07	0.81	4.18	0.82	4.07	1.12	4.18	1.16	4.12	0.98
3. Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body	2.75	1.18	2.93	1.25	2.93	1.28	2.64	1.40	2.81	1.25
4. Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws attention away from my own personal experiences of my body.	3.46	1.04	3.64	0.99	3.39	1.34	3.39	1.26	3.47	1.15
5. I would be sceptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.	3.68	0.95	3.93	1.02	3.64	1.03	3.71	1.05	3.74	1.00
6. Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.	4.00	0.94	3.93	0.94	3.96	1.17	4.14	0.93	4.01	0.99
7. Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.	3.96	1.00	3.82	1.06	3.82	1.28	3.89	1.07	3.88	1.09

Table 6.3: Mean and Standard Deviations for Each Item on the CVD Risk Biochip Body-Relatedness Scale by Existential Prime and Self-Esteem Biochip (Re-scored Values)

6.2.3 Principal Component Analyses

The questionnaire data pertaining to the behavioural and attitude scales for the fourth study did not fit a Confirmatory Factor Analysis (CFA) model based on the results of the PCAs from either of the first two studies. Additionally, since the primary reason for conducting factor analysis was data reduction in this case, it was deemed appropriate to perform additional PCAs on the CVD Risk Biochip Attitude Scale, the CVD Risk Biochip Behavioural Intentions Scale and the CVD Risk Biochip Body-Relatedness Scale respectively in a similar fashion to the PCAs for the first two studies.

As with the first two studies, the central aim of PCA was to find items that best represented single constructs for each of the individual scales of interest for this study. An additional aim of PCA was to ensure that the retained items in the CVD Risk Biochip Attitude Scale and the CVD Risk Biochip Behavioural Intentions Scale were of both a positively and negatively phrased nature in order to control for acquiescence response set answers (as per Winkler et al., 1982). It was not deemed necessary to control for acquiescence response set answers with the CVD Risk Biochip Body-Relatedness Scale as the content of these items did not constitute an appraisal of the CVD Risk Biochip per se but instead asked participants the extent to which they agreed or disagreed with qualitatively different statements concerning the relatedness of the CVD Risk Biochip to their bodily experiences. In other words, the majority of items on this scale were negatively phrased in substantially different ways that may not have been easily answered in an acquiescence response set fashion.

Each of the scales was initially subjected to suitability analyses for PCA. In this regard, the data pertaining to a particular scale was deemed suitable for PCA if many of the correlations for the items were above 0.3, if the *MSA* values for individual items were above 0.7 and if a statistically significant result on Bartlett's Test of Sphericity and a *KMO* value above 0.6 was obtained (following the recommendations of Pett et al., 2003).

6.2.3a PCA of the CVD Risk Biochip Attitude Scale

While the CVD Risk Biochip Attitude Scale data was initially deemed suitable for PCA (as many correlation coefficients for the items were above 0.3, a statistically

significant result on Bartlett's Test of Sphericity [X^2 (36) = 378.64, $p < 0.001$] and a *KMO* value of 0.82 were achieved and the majority of *MSA* values produced for individual items were above 0.7), it was observed that the item "Diagnostic Testing should be left to the Professionals" produced an *MSA* value of 0.58. As this item had achieved similarly low *MSA* values in the results of the first two studies and had been considered to potentially represent a different construct to the other items in the scale, it was deemed appropriate to remove this item from subsequent analyses. Further suitability analyses for PCA with the remaining eight items suggested that the data were now even more suitable for PCA as there was a higher *KMO* value of 0.84, all remaining *MSA* values were now >0.79 and there was an additional statistically significant result on Bartlett's Test of Sphericity [X^2 (28) = 345.45, $p < 0.001$].

The unrotated PCA on the eight items revealed the presence of one component with an eigenvalue exceeding 1. The scree plot also revealed a clear break after the second component. However, this remaining extracted factor only accounted for 49.51% of the variance in the data, which was just below the expected range for social science studies indicated by Pett et al. (2003). In light of this slightly lower than expected variance explained, and as the item "The CVD Risk Biochip makes me anxious" in the unrotated solution to the PCA obtained a low communality result (0.18); it was decided to delete this item and re-run the PCA with the remaining seven items. The remaining seven items were once again deemed suitable for PCA as they obtained a strong *KMO* value (0.84), a statistically significant Bartlett's Test of Sphericity [X^2 (21) = 325.40, $p < 0.001$], many correlations over 0.3 (see Table 6.4) and all *MSA* values over 0.70.

Item	1	2	3	4	5	6	7	M	SD
1. The CVD Risk Biochip is an exciting new device.	1.00							4.39	0.74
2. The CVD Risk Biochip makes me feel empowered about my health.	0.42	1.00						3.73	1.00
3. The CVD Risk Biochip will only serve to frighten people about their health.	0.39	0.36	1.00					3.91	1.02
4. The CVD Risk Biochip is a valuable new device.	0.72	0.52	0.57	1.00				4.30	0.76
5. Moving diagnostic testing from hospital settings to the home is a great idea.	0.31	0.29	0.33	0.35	1.00			3.80	1.11
6. The CVD Risk Biochip will encourage people to take a more active approach to their health.	0.50	0.54	0.46	0.55	0.45	1.00		4.04	0.97
7. The CVD Risk Biochip is an unnecessary device.	0.46	0.41	0.59	0.67	0.37	0.45	1.00	4.28	0.85

Table 6.4: Correlation Matrix and Descriptive Statistics for the 7-Item Solution for the CVD Risk Biochip Attitude Scale

The unrotated PCA for the remaining seven items revealed the presence of a single component with an eigenvalue over one and a clear break on the scree plot after the second component. This single component solution accounted for 54.57% of the variance in the data set; an improvement of almost 5% of the variance explained compared to the eight item PCA solution. The seven items that remained constituted a roughly equal balance of both negatively phrased and positively phrased items and a reliability analysis of these items revealed a Cronbach's Alpha of 0.85, with each item contributing significantly to the variance explained. Following this, the single component solution of the remaining seven items was deemed appropriate to be retained for further analyses (See Table 6.5 for factor loadings relating to this single component solution).

Item		Component 1
1.	*The CVD Risk Biochip is a valuable new device.*	0.87
2.	*The CVD Risk Biochip is an unnecessary device.*	0.78
3.	*The CVD Risk Biochip will encourage people to take a more active approach to their health.*	0.77
4.	*The CVD Risk Biochip is an exciting new device.*	0.75
5.	*The CVD Risk Biochip will only serve to frighten people about their health.*	0.72
6.	*The CVD Risk Biochip makes me feel empowered about my health.*	0.69
7.	*Moving diagnostic testing from hospital settings to the home is a great idea.*	0.57

Table 6.5: Factor Loadings from the PCA on the 7-Item Solution for the CVD Risk Biochip Attitude Scale

6.2.3b PCA of the CVD Risk Biochip Behavioural Intentions Scale

Suitability analyses for the CVD Risk Biochip Behavioural Intentions Scale revealed that the data were suitable for PCA (the data obtained a *KMO* value of 0.73, a statistically significant result on Bartlett's Test of Sphericity [X^2 (15) = 263.55, $p < 0.001$], many correlations for items in the scale over 0.3 and the majority of *MSA* values for individual items were above 0.7). However, the item "At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable" produced a very low *MSA* value of 0.56. Consequently, this item was removed and the analyses were re-run with the remaining five items. This remaining data was found to be more suitable for PCA as the *MSA* values for each of the items was above 0.7. Additionally, the five-item solution obtained a *KMO* value of 0.76, a statistically significant result on Bartlett's Test of Sphericity [X^2 (10) = 204.92, $p < 0.001$] and many correlations for items in the scale over 0.3. A correlation matrix and descriptive statistics for this data are presented in Table 6.6 below.

Item	1	2	3	4	5	M	SD
1. *If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.*	1.00					3.19	1.37
2. *I would buy the CVD Risk Biochip if my GP recommended it*	0.53	1.00				4.29	0.91
3. *The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.*	0.72	0.59	1.00			3.47	1.19
4. *At this moment, I feel particularly motivated to use the CVD Risk Biochip.*	0.40	0.40	0.47	1.00		2.88	1.37
5. *At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.*	0.50	0.32	0.36	0.46	1.00	3.64	1.15

Table 6.6: Correlation Matrix and Descriptive Statistics for the 5-Item Solution of the CVD Risk Biochip Behavioural Intentions Scale

A single component was identified in the unrotated PCA for the remaining five items as there was only one component with an eigenvalue over one and a clear break on the scree plot after the second component. This single component accounted for 58.43% of the variance in the data set and contained roughly the same amount of negatively phrased and positively phrased items (Table 6.7 below provides factor loadings for this single component solution). The data were also deemed highly reliable, obtaining a Cronbach's Alpha of 0.82 with each item contributing significantly to the variance explained. In light of the above, this five-item single component solution was retained for further analyses.

Item		Component 1
1.	*If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.*	0.84
2.	*At this moment, I feel particularly motivated to use the CVD Risk Biochip.*	0.84
3.	*The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.*	0.75
4.	*At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.*	0.70
5.	*I would buy the CVD Risk Biochip if my GP recommended it*	0.67

Table 6.7: Factor Loadings from the PCA on the 5-Item Solution of the CVD Risk Biochip Behavioural Intentions Scale

6.2.3c PCA of the CVD Risk Biochip Body-Relatedness Scale

As with the suitability analyses for the other two scales, the initial seven-item CVD Risk Biochip Body-Relatedness Scale was deemed suitable for PCA. In this case, the seven-item scale obtained a *KMO* value of 0.82, a statistically significant result on Bartlett's Test of Sphericity [X^2 (21) = 206.15, $p < 0.001$], many item inter-correlations that were over 0.3 and the majority of *MSA* values for individual items were above 0.7. As one item had a particularly low *MSA* value of 0.46 ("Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body") and was the only item that loaded strongly onto a second factor in the initial unrotated PCA result (which accounted for 15.18% of the variance in the sample), it was deleted and the suitability analyses were re-run. This set of suitability analyses indicated that the remaining six-item solution was appropriate for PCA due to the following results; a *KMO* value of 0.84, a statistically significant result on Bartlett's Test of Sphericity [X^2 (15) = 196.87, $p < 0.001$], many inter-item correlations over 0.3 and all *MSA* values above 0.7. The unrotated PCA for the six-item solution revealed a single component upon examination of the scree plot and the eigenvalues over one. This single component solution accounted for 52.34% of the variance alone, which was within the realistic expected range for social science research (as per Pett et al., 2003). A subsequent reliability analysis of the six items revealed a highly reliable Cronbach's Alpha of 0.81. Inter-item correlations and descriptive statistics for the

six-item solution are presented in Table 6.8 below and factor loadings for this single component solution, which was retained for further analyses, are given in Table 6.9.

Item	1	2	3	4	5	6	M	SD
1. *The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences*	1.00						3.40	1.13
2. *Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.*	0.44	1.00					4.12	0.98
3. *Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.*	0.26	0.47	1.00				3.47	1.15
4. *I would be sceptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.*	0.31	0.48	0.49	1.00			3.74	1.00
5. *Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.*	0.25	0.38	0.43	0.50	1.00		4.01	0.99
6. *Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.*	0.31	0.51	0.56	0.46	0.49	1.00	3.88	1.09

Table 6.8: Correlation Matrix and Descriptive Statistics for the 6-Item Solution of the CVD Risk Biochip Body-Relatedness Scale

Item		Component 1
1.	*Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.*	0.79
2.	*Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.*	0.76
3.	*I would be sceptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.*	0.76
4.	*Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.*	0.75
5.	*Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.*	0.71
6.	*The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences*	0.55

Table 6.9: Factor Loadings from the PCA on the 6-Item Solution of the CVD Risk Biochip Body-Relatedness Scale

6.2.4 Data Clean-up, Tests of Normality and Transformations of the Data Scales

Following PCA, participants' scores on the remaining items in each of the scales were summed to form composite attitudes, behavioural intentions and body-relatedness scores respectively. Tests of normality were then conducted on each of these sets of composite scores. While the behavioural intentions data appeared to approximate normality, Kolmogorov-Smirnov statistics, Shapiro Wilks statistics, histograms with normality plots and Normal Q-Q Plots indicated that both sets of composite scores pertaining to the attitudes and body-relatedness scales appeared to have a negative skew. In order to remedy this issue, several different transformations were attempted for each data set in line with Tabachnick & Fidell's (2001) data transformation guidelines. Square root transformations were found to achieve Shapiro Wilks values, Kolmogorov-Smirnov values and histogram shapes for the two composite data sets that approximated normality more closely. These transformed data sets were then retained for further analyses.

Additionally, tests of normality were conducted on the Essay Evaluation questionnaire data. In line with previous research using Goldenberg et al.'s (2001) Existential Prime methodology (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Cox et al., 2007), composite scores of participants' responses to these items had initially been created by taking the mean responses to the six items (Cronbach's Alpha = 0.91). The resultant data set was found to closely approximate normality on Kolmogorov-Smirnov statistics, Shapiro Wilks statistics, histograms with normality plots and Normal Q-Q Plots. Consequently, no data transformations were deemed necessary for this data set.

6.2.5 ANOVA on the Essay Evaluation Questionnaire

Following Goldenberg et al. (2001) and subsequent research using the Existential Prime methodology (e.g. Goldenberg et al., 2002; Cox et al., 2007), participants' mean responses to the Essay Evaluation items were examined with a 2 (Existential Prime) x 2 (Self-Esteem task) ANOVA. The results revealed no significant effects for the Existential Prime, the Self-Esteem tasks or either of the two independent measures in combination; F (1, 107) = 2.94, p = 0.09; η^2 = 0.03, F (1, 107) = 0.07, p = 0.79; η^2 = 0.00 and F (1, 107) = 1.65, p = 0.20; η^2 = 0.02. Descriptive Statistics pertaining to this measure are given in Table 6.10.

	Existential Prime	**M**	**SD**	**Self-Esteem**	**M**	**SD**
Literature	*Creaturely*	5.47	1.50	*Bolster*	5.68	1.66
Evaluation	*Uniqueness*	5.97	1.60	*Threat*	5.76	1.44

Table 6.10: Descriptive Statistics for the ANOVA Dependent Variable Scores for the Literature Evaluation Questionnaire by Existential Prime and Self-Esteem Prime

6.2.6 MANCOVA on CVD Risk Biochip Attitudes Scale and CVD Risk Biochip Behavioural Intentions Scale

A 2 x 2 x 2 MANCOVA was carried out with the attitudes and behavioural intentions data as dependent variables and gender as a covariate in order to investigate whether or not there were differences in participants' appraisal of the CVD Risk Biochip based on their membership of one of the four experimental conditions (Self-Esteem Bolster / Creatureliness Prime, Self-Esteem Threat / Creatureliness Prime, Self-Esteem Bolster / Uniqueness Prime and Self-Esteem Threat / Uniqueness Prime). In

keeping with the first two studies of the programme, gender was included as a covariate to remove any potential bias in participants' appraisal of the CVD Risk Biochip arising from their gender.

As neither of the data sets violated any of the assumptions of normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, multicollinearity, independence of the covariates from the experimental treatments and reliability of the measurement of the covariates, the data were deemed suitable for MANCOVA. The respective results for the MANCOVA with the combined dependent variables pertaining to the Existential Prime, Self-Esteem task and these two independent measures in combination were; $F(2, 106) = 0.75$, $p = 0.47$; Wilk's Lambda = 0.99; $\eta^2 = 0.01$; $F(2, 106) = 0.12$, $p = 0.89$; Wilk's Lambda = 1.00; $\eta^2 = 0.00$ and $F(2, 106) = 0.06$, $p = 0.94$; Wilk's Lambda = 1.00; $\eta^2 = 0.00$. Since these analyses uncovered no statistically significant differences between any of the groups on the combined dependent variables after controlling for gender as a covariate, no further post-hoc tests of between-subjects effects were deemed necessary between the groups. Descriptive statistics pertaining to the MANCOVA are presented in Table 6.11.

	Existential Prime	**M**	**SD**	**Self-Esteem**	**M**	**SD**	**Gender**	**M**	**SD**
Attitudes	*Creaturely*	27.86	5.21	*Bolster*	28.32	5.05	*Male*	28.05	4.12
	Uniqueness	29.05	4.11	*Threat*	28.59	4.38	*Female*	28.70	5.04
Behavioural	*Creaturely*	17.00	4.88	*Bolster*	17.29	4.94	*Male*	17.64	4.11
Intentions	*Uniqueness*	17.93	4.32	*Threat*	17.64	4.30	*Female*	17.36	4.92

Table 6.11: Descriptive Statistics for the Untransformed MANCOVA Dependent Variable Scores by Existential Prime, Self-Esteem Prime and Covariate of Gender

6.2.7 ANCOVA on CVD Risk Biochip Body-Relatedness Scale

In order to examine if there were differences in participants' assessment of the body-relatedness of the information proposed to be reported by the CVD Risk Biochip depending on their membership of one of the four experimental groups, a two-way between subjects ANCOVA was conducted on the body-relatedness data as a dependent variable and gender as a covariate. As with previous analyses, gender was included as a covariate to remove any potential bias in participants' assessment of the

body-relatedness of the information proposed to be reported by the CVD Risk Biochip arising from their gender.

The body-relatedness data did not violate any of the assumptions of ANCOVA relating to normality, linearity, univariate outliers, homogeneity of variance-covariance matrices, multicollinearity, reliability of the covariate and homogeneity of regression slopes. Therefore, this data was deemed suitable for ANCOVA. The respective results of the analyses are as follows for the Existential Prime, Self-Esteem task and these two independent measures in combination: $F(1, 107) = 0.33$, $p = 0.57$; $\eta^2 = 0.00$, $F(1, 107) = 0.30$, $p = 0.59$; $\eta^2 = 0.00$ and $F(1, 107) = 0.04$, $p = 0.84$; $\eta^2 = 0.00$. These analyses revealed no significant differences between the groups on body-relatedness after controlling for gender as a covariate. Consequently, no further post-hoc tests of between-subjects effects were conducted. Table 6.12 provides descriptive statistics for the ANCOVA.

	Existential Prime	**M**	**SD**	**Self-Esteem**	**M**	**SD**	**Gender**	**M**	**SD**
Body-Relatedness	*Creaturely Uniqueness*	22.39 22.86	4.71 4.45	*Bolster Threat*	22.41 22.84	4.78 4.37	*Male* *Female*	23.02 22.39	3.17 5.23

Table 6.12: Descriptive Statistics for the Untransformed ANCOVA pertaining to the CVD Risk Biochip Body-Relatedness Scale Scores by Existential Prime, Self-Esteem task and Covariate of Gender

6.2.8 Logistic Regression of De Facto Intentions

In keeping with the first two studies of the current research programme, a logistic regression was performed with the De Facto Intentions Measure as a dependent variable. The main purpose of this analysis was to examine whether or not receipt of either one of the Existential Primes or one of the Self-Esteem tasks would help to predict the odds of whether or not participants chose to sign up for a CVD Risk Biochip pilot study. Additionally, gender was included to control for the potential differences between middle-aged males and females in their participation of health-oriented behaviours that have been previously discussed in the health psychology literature (e.g. Parslow, et al., 2004; Evans, et al., 2005; Janda, et al., 2004).

As a means of preparation for this analysis, each of the variables had been initially coded into sets of separate binary dichotomous variables. For the dependent variable itself, a score of 0 indicated that a participant had not signed up for the pilot study, whereas a score of 1 indicated that a participant had signed up for it. Each of the condition variables were also coded with either a score of 0 or a score of 1; 0 represented that a participant had received the Uniqueness Prime and 1 represented that a participant had received the Creatureliness Prime for the Existential Prime conditions, whereas 0 signified a participant's receipt of the Self-Esteem Bolster task and 1 signified a participant's receipt of the Self-Esteem Threat task. Finally, a score of 0 was used to indicate a male participant and a score of 1 was used to indicate a female participant for the gender variable.

An initial check for the assumptions of logistic regression confirmed that there was an absence of multicollinearity between the sets of independent variables. Testing the model with the three predictors (Existential Prime, Self-Esteem task and gender respectively) against a constant-only model indicated no significant improvement of the logistic regression model upon the odds of whether or not participants signed up for the CVD Risk Biochip pilot study that were accountable by chance; X^2 (3, n = 78) = 1.62, $p > 0.05$. In other words, neither the receipt of one of the Existential Primes, nor receipt of one of the Self-Esteem tasks, nor a participant's gender helped to reliably predict whether or not they had signed up for the pilot study. Regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals pertaining to the odds for each of the three predictors are presented in Table 6.13.

Variables	*B*	Wald Chi-Square	Odds Ratio	95% Confidence Interval For Odds Ratio	
				Lower	Upper
Existential Prime	0.15	0.15	1.17	0.54	2.52
Self-Esteem	0.00	0.00	1.00	0.46	2.16
Gender	-0.47	1.22	0.63	0.28	1.42
Constant	0.73	2.83	2.07		

Table 6.13: Logistic Regression Analysis, containing Regression Coefficients, Wald Statistics and Odds Ratios for the Predictors and the Constant Term and 95% Confidence Intervals Relating to Odds Ratios for the Predictors

6.3 DISCUSSION

Contrary to the predictions derived from TMT in the current study, there was no evidence that existential concerns relating to either human creatureliness or self-esteem had any substantial impact on participants' appraisal of the CVD Risk Biochip. In relation to the Existential Prime, the lack of significant differences between participants who received an essay emphasising the similarity of humans to other animals and those who received an essay emphasising the creatureliness of humans on either their attitudes towards the device or their behavioural intentions and commitment towards its use led to a rejection of the hypothesis that priming human creatureliness and providing a subsequent distraction would lead to greater avoidant responses towards the device than priming human uniqueness and providing a similar distraction. Similarly, the lack of significant differences on the same measures between participants who had completed the task that was designed to threaten their self-esteem and those who had completed the task designed to boost their self-esteem engendered the rejection of the hypothesis that threatening participants' self-esteem would produce more avoidant responses towards the device than boosting participants' self-esteem. Finally, the hypothesis that those participants who received both the Self-Esteem Threat task and participants who were given the Creatureliness Prime would exhibit the most avoidant responses towards the device compared to the other three groups was rejected on the grounds that there was a lack of significant results between this group and the other groups on the attitudes scale, behavioural intentions scale and "De Facto Intentions" measure.

As expected by the alternative hypothesis, there were also no significant differences between participants from any of the groups' responses on the CVD Risk Biochip Body-Relatedness Scale. However, it should be noted that the means scores for these items were generally in the unexpected direction, with all of the items that had been included in the composite CVD Risk Biochip Body-Relatedness Scale achieving mean scores above 3; the middle score of the Likert Scale. Consequently, the composite CVD Risk Biochip Body-Relatedness data do not appear to support the alternative hypothesis that all participants would indicate that the proposed risk information to be derived from the CVD Risk Biochip could not be easily related to the general sense of health and well-being that they normally experienced from their bodies. In other words, participants did not suggest that they would experience feelings of disembodiment or dissociation towards the risk information that the CVD Risk Biochip was proposed to provide.

6.3.1 Possible Explanations for the Rejection of the Central Hypotheses Relating to TMT

The lack of significant differences between the groups who received the Creatureliness and Uniqueness Primes respectively on their appraisal of the CVD Risk Biochip and commitment towards its use suggests that thinking about the creaturely aspects of being human and receiving a subsequent distraction did not elicit more avoidant responses towards the device compared to thinking about a control topic. In other words, the current study failed to demonstrate that there were any barriers to the use of the CVD Risk Biochip resulting from receipt of the Creatureliness Prime and a distraction. Furthermore, despite the fact that the studies carried out by Goldenberg and colleagues (Goldenberg et al., 2008; Goldenberg et al., 2009) relating to cancer detection appear to be analogous to the current study in their design (i.e. due to their analogous assessment of participants' behavioural intentions to perform body-focused behaviours with the potential to detect a life-threatening condition following a Creatureliness Prime and distraction task), the results of the current study differ substantially from these studies by virtue of the fact that the Creatureliness Prime did not lead to more fearful and avoidant reactions towards the detection-orienting behaviour of using the CVD Risk Biochip. These findings are particularly pertinent as they run contrary to Goldenberg's (2005) predictions that the

human creatureliness construct may be particularly relevant to health-orienting behaviours that involve a degree of confrontation with the human body.

As mentioned earlier, use of the CVD Risk Biochip involves a degree of bodily confrontation by necessitating the use of a blood sample; an act which draws one's attention to the mortal process of bleeding and is accompanied by an analytic search for the presence of the potentially life-threatening condition of CVD. However, in spite of the potential bodily confrontation involved in the use of the CVD Risk Biochip, the Creatureliness Prime did not have any impact on participants' appraisals of the device in the current study. Consequently, Goldenberg (2005) may have exceeded the explanatory power of the evidence used to support her claim that human creatureliness is particularly relevant to health-orienting behaviours involving bodily confrontation. Indeed, the evidence that she had used to support this claim amounted to the results of the set of studies that were subsequently published as Goldenberg et al. (2008); a set of studies that specifically involved breast self-exams rather than a variety of different health-orienting behaviours involving bodily confrontation. While subsequent TMT research on health threat detection behaviours since Goldenberg's (2005) commentary article was published have examined participants' responses towards mammograms and testicular examinations (e.g. Arndt et al., 2007; Goldenberg et al., 2009), this research has yet to examine health threat detection behaviours that involve a degree of bodily confrontation other than cancer screening (e.g. the use of a POCT device like the CVD Risk Biochip).

Interestingly, it appears that the most likely explanation for the results from the current study pertaining to the Creatureliness Prime may be attributed to participants' appraisal of the task itself. Previous TMT research that incorporated this task had found that the essay on human creatureliness was consistently evaluated in a more negative fashion by participants than the essay on human uniqueness (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Cox et al., 2007; Goldenberg et al., 2008). In each of these studies, this finding was taken as evidence that the Creatureliness Prime was more threatening to participants than the Uniqueness Prime. In other words, by the logic of previous TMT researchers who employed this task, greater negative evaluations of the Creatureliness Prime among participants served to confirm that these participants were defensively reacting towards the content of these

essays, presumably due to the existentially threatening nature of the creaturely descriptions of humans contained within them. However, in stark contrast to these studies, there was no significant difference between participants' evaluations of the essay on human creatureliness and participants' evaluations of the essay on human uniqueness in the current study. This implies that the Creatureliness Prime did not represent a substantial existential threat to participants in the current study by virtue of the fact that they were not compelled to react defensively towards the author of the essay when they were given the opportunity. This absence of existential threat among participants who read the creaturely essay may also account for the lack of significantly different appraisals of the CVD Risk Biochip between these participants and those who read the uniqueness essay. That is to say, neither group were threatened enough by the essay they received to exhibit more fearful or avoidant reactions towards the device on the basis of this measure.

There are a number of possible ways of accounting for the finding that participants were not threatened by the Creatureliness Prime in the current study. One possible explanation is that the Self-Esteem Threat task which preceded it served to override the existentially-threatening potency of the Creatureliness Prime. However, this explanation does not seem plausible for a couple of reasons. Firstly, previous research using the Creatureliness Prime did not uncover evidence to support the idea that the existentially-threatening potency of this task could be superseded by a prior existential threat. In contrast, numerous studies have demonstrated more severely existentially-related defensive reactions among participants who received a Mortality Salience task and a subsequent Creatureliness Prime in combination compared to participants who were presented with one or the other of these existentially-relevant tasks in combination with a Control task (e.g. Goldenberg et al., 2008; Goldenberg et al., 2009). For instance, Goldenberg et al. (2008) found that only a Creatureliness Prime rather than a Uniqueness Prime led to reduced intentions to conduct breast self-exams following Mortality Salience. The second reason why it is unlikely that the Self-Esteem Threat task served to override the existentially-threatening potency of the Creatureliness Prime relates to the fact that the current study contained a 2 x 2 independent measures design as a function of the Self-Esteem task and Existential Prime that participants received. This study design means that, even in the event that the existential threat associated with the Creatureliness Prime was superseded by the

existential threat accompanying the preceding Self-Esteem Threat task, one would still expect that the Creatureliness Prime would elicit defensive reactions among participants who received it following a Self-Esteem Bolster task (i.e. following the previous research relating to this task such as Goldenberg et al., 2008). However, as indicated above, such defensive reactions were not displayed among participants who received a Self-Esteem Bolster task followed by a Creatureliness Prime. Consequently, the explanation that the Self-Esteem Threat task served to override the existentially-threatening potency of the Creatureliness Prime does not appear to be plausible.

An alternative explanation for the failure of participants who received the Creatureliness Prime to find the task existentially threatening relates to the previous use of the task in the TMT literature. Since this task had only ever previously been used with American participants and involves the evaluation of essays that are purported to have been written by students from the University of Missouri, it is possible that cultural in-group/out-group biases may have had an influence on participants' evaluations of the essays (for a detailed review of the intergroup bias literature see Hewstone, Rubin & Willis, 2002). Much prior TMT research has found that in-group/out-group biases may be particularly important for people when they are faced with reminders of their mortality (e.g. Greenberg et al., 1990; Greenberg et al., 1994; Arndt et al., 1997b; Greenberg et al., 2000; Arndt et al., 2002; Schimel et al., 2007). Furthermore, previous TMT research has found that one's national identity may be particularly important with respect to the relevance of particular worldviews to oneself. For instance, Schimel et al. (2007) found that Canadian participants who read an essay that derogated a valued component of their national identity exhibited increased distal defensive responses compared to Canadians who read an essay that derogated a valued component of Australians' national identity. Following such ideas, Irish participants' perceptions of the authors of the essays in the current study may have been more informed by their perceptions of American students generally than by their emotional reactions towards the essays themselves. In other words, Irish participants may not have found these essays to be particularly existentially relevant as they might have identified the authors of these essays as representing a cultural out-group on the basis of their national identity.

In a slightly different but somewhat related fashion, it is possible that creaturely descriptions of humans may not be as repulsive to the Irish. For instance, there is a wealth of historical evidence and anthropological accounts that demonstrate that many Irish people had to deal with racial slurs that involved likening them to animals at least up until the late 19th Century (e.g. Earls, 1988; Curtis, 1997; Orser Jr., 1998; Mullin, 1999; Engle, 2001; Knobel, 2001; Hinds, 2004; Lloyd, 2005; Soper, 2005). This set of experiences may have culturally habituated the Irish to ideas about their potential similarity to other animals, thereby moderating their experience of the sort of creaturely reminders that were proposed by Goldenberg et al. (1999). Indeed, Irish people seem to have no problem referring to others in their cultural group as "creatures" (a common Irish colloquial term used to affectionately refer to others). In contrast, Americans may have more vehement reactions against animalistic depictions of humans in the ways that have been demonstrated in previous TMT studies (e.g. Goldenberg et al., 1999; Goldenberg et al., 2001; Goldenberg et al., 2002; Cox et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). Furthermore, there is some evidence to suggest that Americans may even be more squeamish about body-confrontations than their European equivalents. For instance, while cross-cultural studies concerning disgust-related phobias are rare, a couple of exploratory studies from the health psychology literature have shown that Americans are more fearful of injections and blood draws than Dutch counterparts (e.g. Arrindell et al., 1987; Olatunji, Sawchuk, de Jong & Lohr, 2006). When taken together, these results suggest that Irish participants may not have found creaturely reminders to be as existentially threatening as those American participants who have participated in prior TMT research involving this method.

Following the above set of explanations, it is possible that the cross-cultural reliability of the creatureliness manipulation may require further investigation. Firstly, human creatureliness and human uniqueness essays that have been written by American students may not be identified as relevant mortality reminders to non-American participants due to a perceived lack of cultural relevance of such reminders. Additionally, the effects of the creaturely manipulation that have been reported in the TMT literature so far may not be relevant to cultural groups who have become habituated to thinking about their similarity to other animals following racial slurs involving their alleged animality (e.g. Africans, American Indians or the Irish, as per

Mullin, 1999; Hinds, 2004; Soper, 2005). Consequently, the TMT-related defences that have been reported in these prior studies involving the creatureliness manipulation need to be replicated in a variety of cultural contexts in order to establish the reliability of this method.

The separate finding that receipt of one of the Self-Esteem tasks did not elicit significant differences in participants' attitudes towards the CVD Risk Biochip and behavioural intentions and commitment towards its use also suggests that, contrary to the expectations of TMT, threats to self-esteem did not have any effect on participants' subsequent appraisal of the device. Similarly, the pattern of results relating to the Self-Esteem task implies that attempts to boost participants' self-esteem also had no effect on their appraisal of the device. Taken together, these findings suggest that self-esteem threats may not lead to more avoidant responses towards the CVD Risk Biochip as a way of sidestepping the potential for further existential anxiety that use of a device to indicate the presence or absence of a life-threatening condition entails. This finding appears to conflict with previous TMT research that has found that self-esteem threats increase the accessibility of death-related thoughts (e.g. Hayes et al., 2008; Routledge et al., 2010), that high state self-esteem can provide a buffer to the effects of existential anxiety, whereas the experience of low state self-esteem can make one more vulnerable to the effects of existential anxiety (e.g. Greenberg et al., 1992b; Greenberg et al., 1993; Harmon-Jones et al., 1997; Van Den Boss, 2001; Hart et al., 2005; Schmeichel et al., 2009; Routledge et al., 2010) and the more specific findings that threats to self-esteem may result in avoidant responses towards health-orienting behaviours when people are in a distal mode of defence (e.g. Routledge et al., 2004).

As with the Existential Prime, the most likely explanation for the lack of significant differences between the Self-Esteem Bolster and Self-Esteem Threat conditions is that participants did not find the Self-Esteem Threat task to be particularly existentially threatening. This idea appears to make sense when one notes that participants in the Self-Esteem Bolster condition more consistently indicated that they found the task of writing about a great personal success to be very difficult. More specifically, many participants in this condition spent a huge amount of time on this task and sought clarification from the researcher with regard to the types of responses

that were deemed acceptable. In contrast, participants who received the Self-Esteem Threat task appeared to find the completion of this task to be relatively straight-forward. This was tacitly demonstrated by the shorter amount of time that they spent completing the self-esteem task and the observation that few of these participants asked for clarification in relation to the task. In other words, participants appeared to be less hesitant with the Self-Esteem Threat task than with the Self-Esteem Bolster task. While these effects would need to be replicated under more controlled circumstances (e.g. with the use of a stopwatch or computer-based software to measure participants' reaction time towards completion of the task), such reactions suggest that participants may have been more comfortable completing the Self-Esteem Threat task than the Self-Esteem Bolster task. This may also mean that those who completed the Self-Esteem Threat task did not find the task to be particularly existentially threatening. Furthermore, this finding may be linked to the phenomenon that Irish people tend to value humility and self-deprecation over self-aggrandisement.

The tendency for Irish people to favour self-deprecation over the lauding of their achievements has been acknowledged in the sociological literature. For instance, in a sociological analysis of the role of the Roman Catholic Church in forging a national identity for the Irish people, William Crotty (2006) suggests that the obedience to church teachings emphasizing humanity, docility and obedience to authority led the Irish to display a personality type that was characterised by passivity, self-criticism and self-deprecation. In a similar sociological analysis of the cultural heritage of self-denial among the Irish people, Tom Inglis (2006) has suggested that the common Irish characteristic of self-deprecation may be closely linked to the strong traditional Catholic values of self-denial and "making do". In order to elucidate this claim, he points towards the fact that Irish people "love to hear the high and mighty tell self-deprecating stories about themselves" (p. 36). The idea of self deprecation as a common Irish trait seems to have even filtered into popular media representations of the Irish people. For instance, in the most recently published Lonely Planet guide to Ireland, Fionn Davenport (2012) has provided anecdotal evidence that the Irish people are "very suspicious of praise and tend not to believe anything nice that is ever said about them" (p. 48).

This cultural pattern of self-deprecation may have meant that the Irish participants in the current study were not existentially threatened by a task that asked them to report a time when they failed to live up to an important value. On the contrary, they may have unconsciously found the completion of such a task to be a normal or everyday expression of their "Irishness". Additionally, negative cultural perceptions of self-aggrandisement could account for the absence of a more positive appraisal of the CVD Risk Biochip among Irish participants who received the Self-Esteem Bolster task and their seeming perplexity in completing the task. In other words, these participants may have had difficulty with the Self-Esteem Bolster task as it instructed them to describe living up to an important value; a description that they may have found difficult due to cultural norms where the lauding of one's accomplishments is frowned upon. When these ideas are considered in combination with the evidence of delays and discomfort among participants who received the Self-Esteem Bolster task in comparison to those who received the Self-Esteem Threat task, it appears likely that Irish cultural norms of self-deprecation and wariness about self-aggrandisement may have interfered with the potential for this measure to elicit existential anxiety among participants. As with the creaturely manipulation, this particular measure had also only been previously used on American participants. Consequently, it is possible that the cross-cultural reliability of this measure may also be questionable. That is to say, this particular measure may not work with cultural groups like the Irish who are prone to self-deprecation; an idea that may require further investigation.

In sum, in a similar fashion to the results of the first two studies in the current research programme, participants' reactions towards the CVD Risk Biochip in the current study did not appear to resemble the pattern of avoidant responses following mortality reminders and a distraction that had been found in seemingly analogous TMT research studies relating to cancer screening (e.g. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). Furthermore, neither of the two independent measures in combination led to any significant differences in either attitudes towards the device or behavioural intentions towards its use or commitments to using the device in the future. As a result, the third experimental hypothesis following TMT that those participants who received both the Self-Esteem Threat task and the Creatureliness Prime together would exhibit the most avoidant responses towards the device was also rejected. This result is in keeping with the lack of

significant results found with respect to each of the dependent measures relating to TMT when either the Self-Esteem tasks or the Existential Primes were considered in isolation. In other words, since there was no effect of existential threat on participants' appraisal of the device with either of these independent measures in isolation, it is perhaps unsurprising that there were no significant effects of these tasks in combination on participants' appraisals of the device. As noted above, the lack of existential threat to participants relating to these tasks may have resulted from the fact that Irish participants took part; a cultural group who are commonly known to belittle themselves and have difficulty with praising themselves (e.g. Crotty, 2006; Inglis, 2006) and who may be less vulnerable to the effects of the creaturely manipulation (e.g. as a result of having become habituated to thinking about their similarity to other animals due to a history of being compared to animals in a pejorative sense; e.g. Earls, 1988; Curtis, 1997; Orser Jr., 1998; Mullin, 1999; Engle, 2001; Knobel, 2001; Hinds, 2004; Lloyd, 2005; Soper, 2005). Following this, the cross-cultural reliability of both the self-esteem and creaturely manipulations may need to be further established in future TMT research (i.e. these measures should be used on other non-American samples of participants).

6.3.2 The Body-Relatedness of CVD Risk Information and the Value of Experiential Knowledge to Participants

As previously noted, while there was a lack of significant differences between participants' responses on the CVD Risk Biochip Body-Relatedness Scale as a function of their group, the fact that the mean scores for these items were above the middle Likert rating in relation to their "body-relatedness" meant that the alternative hypothesis that participants could not easily relate the CVD Risk information to their normal body-related sense of health and well-being was not supported. From this it can be surmised that the lack of significant differences on participants' appraisal of the CVD Risk Biochip depending on whether or not they received one of the TMT-related existential primes was not due to a moderating effect of existential anxiety as a result of the abstract nature of the information that the device is purported to provide. This indicates that participants' lack of existential threat when asked to rate their attitudes, behavioural intentions and commitment to use the device did not derive from an experience of a Baudrillardian "hyper-reality" (e.g. 1983; 1995; 2000) in relation to the device. In other words, the apparent lack of evidence of participants'

attempts to avoid the potential for existential threat that use of such a device entails did not occur because of a "cooling" of their responses towards the abstraction and seeming intangibility of the future projections of risk that such diagnostic devices appear to convey (i.e. due to the apparent lack of a clear delineation between whether this risk information is imminent or merely represents a possible future projection that could be modified). In contrast, this apparent lack of existential threat may have more to do with some of the issues concerning the TMT primes used in the current study that have already been discussed above.

An additional point that should be noted concerning the finding from the results of the CVD Risk Biochip Body-Relatedness Scale that participants did not find diagnostic devices like the CVD Risk Biochip to be disassociated or disconnected from their bodily experiences is that the Cartesian Dualistic view of the body that is often linked to the analysis of "objective indicators of the body" through such devices may not represent the "natural" way that people experience their sense of health and well-being. That is to say, the perspective that there is a real separation between mental and physical life which is present in the biomedicalisation of human bodies may constitute a way of seeing that is inherently separate from normal people's everyday experiences of their bodies. Certainly, if the Cartesian perspective were to have been adopted by participants in this study, one might have expected that they would have considered the information to be gained from the CVD Risk Biochip to be unrelated to their own subjective bodily experience in this way due to the potential mind-body separation accompanying this perspective. However, these participants appeared to suggest that the more "objective" information derived from the device could be related to bodily experiences; thereby suggesting that one's bodily experiences and biological physicality are intimately connected. This may mean that the desubjectifying language concerning sick and healthy bodies and the focus on "objective indicators" of the body derived from screen images, stained samples or machine readouts (e.g. Shaw, 2003; Martínez, 2005; Blaxter, 2009; Salter et al., 2011) may be a somewhat artificial perspective that is solely adopted by medical practitioners in order to carry out their work.

Lyon & Barbalet (1994) have suggested that the field of medicine has been central in perpetuating the Cartesian myth of the body-as-object in this way as a means of

establishing their authority over questions relating to the body. Indeed, this vantage point can be seen as a method of distancing the body as an object that is discrete and separate from the practitioners who study it, who may be considered as authorities on the body due to their ability to "see what's wrong" with bodies. Moreover, this "distancing" may relate to Foucault's (1977) explicit suggestion that the process of viewing the body as if it were a lifeless corpse divested of psychological, social and dynamic biological histories through biomedicalisation can serve to transfer the socio-cultural representations of the power that one may have over one's own body to those medical professionals who are capable of "seeing the body" in such ways. For instance, such processes have helped to establish individual sub-disciplines in medicine with their own specific categories of objectification and classification of bodies (e.g. Foucault, 1975; Lupton, 1997); categories which could serve to alienate laypeople.

In contrast to this Cartesian framework derived from biomedicine, laypeople's understanding of their own physical health and their bodies may constitute a more "embodied" perspective that incorporates both subjective experiences of the body and so called "objective indicators" of health and illness. In this context, the idea of "embodiment" may be seen to refer to how our bodies are active and engaged entities that interact with the material and social world, incorporating the contingency of our bodily processes, social and individual histories and the integration of our body, psychology and social interactions together into unified experiences (Krieger, 2005). One of the central proponents of this idea of embodied experience was the French phenomenologist Maurice Merleau-Ponty (e.g. 1962), who suggested that there is a fundamental difference between conceptions of the body as a mere object for perception (often denoted by the German word *Körper*) and the lived experience of a self through the body (denoted by the German word *Leib*). Whereas the *Körper* can be seen to refer to the structural aspects of the body or the body as viewed by another person (i.e. the Cartesian view of the body from medicine described above), the *Leib* constitutes a "living body" that finds expression through feelings, sensations, perceptions and emotions (Ots, 1995). Merleau-Ponty argued that a person's relationship with their body is more accurately understood by the latter concept. He conceived of the body, not as a passive host for a mind, but as "the vehicle" through which we experience the world as a unified portrait of sensorial phenomena

(Merleau-Ponty, 1962). Further to this, he suggested that, rather than being privileged with a "bird's eye view" of the world in the ways implied by scientific-technical rationality, our relationship to this "world" is inevitably one-sided and phenomenal. In other words, we each hold a vantage point at any given moment that is inevitably grounded in our bodily "host". In this way, interpretations of our individual "world of experience" at any given moment are necessarily dependent on our opening up to the information that we receive through our eyes, ears, nose, mouth, limbs, skin and even our proprioceptive sense through which we experience movement and spatial orientation. In sum, Merleau-Ponty (1962) suggested that it is impossible for us to fully understand our bodily experiences and physical health without some understanding of our own sensations, perceptions and ways of structuring and interpreting the information that we might receive about such subjects.

Support from the current study for the idea that lay people's perspectives on their health may be "embodied" in this way also comes from the fact that participants appeared to indicate that they did not value diagnostic information more than their own bodily sense of health and well-being. Specifically, the low mean scores in relation to the item "Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body" (M = 2.81, SD = 1.25) appeared to suggest that the participants in this study valued their body-related experiences at least to the same degree as the sorts of risk information from diagnostic devices like the CVD Risk Biochip. This item had also been found to load highly on to a second factor in the initial PCA on this scale; potentially suggesting that the item itself represented a different construct from the other items in the composite CVD Risk Biochip Body-Relatedness Scale. Indeed, this item appears to represent participants' appraisals of the importance of the risk information that the CVD Risk Biochip was purported to deliver in comparison to their own sense of health and well-being from their bodies. In contrast, many of the other items on the scale related to how surreal the risk information from the device may appear or how easily this information may be understood in relation to a participant's own sense of health and well-being derived from their bodies. The subtle difference between this item and the other items from the CVD Risk Biochip Body-Relatedness Scale is that the former focused on how valuable diagnostic risk information is perceived compared to one's sense of bodily

health, while the latter items focused on the surreal or body-dissociating effects of the CVD Risk Biochip. In other words, while most of the questions on the scale relate to the potential for the CVD Risk Biochip to promote feelings of disembodiment or dissociation towards the risk information the device provides, the item that had been excluded from the composite scale as a result of PCA could be seen to have related to the perceived value of this information and how this value may have related to participants' own sense of health and well-being.

In light of the above, the low mean score in relation to this item potentially suggests that participants perceived that there was at least as much value to be derived from their own intuitive sense of health and well-being from their bodies than from the risk information that devices such as the CVD Risk Biochip convey. In other words, objective indicators derived from the view of the body as a lifeless *Körper* that is subject to mechanical laws of causality were not considered by participants to be a sufficient way of understanding health and illness. Instead, these participants' own subjective experiences of their bodies and local intuitive understandings of their own health were also deemed to be important. Caron-Flinterman, Broerse & Bunders (2005) have given the term "experiential knowledge" to these local understandings of health and illness; a type of knowledge that people gain from the implicit lived experiences that they may have of their own bodies through illness and wellness. These authors have argued that such sources of knowledge can be seen to have very real practical value for both biomedical researchers and patients themselves; not only do patients' needs lead to the formulation of research questions, thereby launching new research projects, but patients' own ideas on etiological aspects of diseases are often translated by practitioners into biomedical hypotheses. Despite this, Caron-Flinterman et al. (2005) provide evidence that there is an almost institutionalised opposition from certain biomedical researchers towards patient participation in biomedical research. For instance, one biomedical researcher in their study commented that "Patients should not interfere in processes of which they know nothing about" (Caron-Flinterman et al., 2005; p. 2576).

The finding that individuals tend to place substantial value on their experiential knowledge is also particularly salient when one notes the findings from the medical sociology literature that biological, psychological and socio-cultural processes are

often implicated in the biomedicalisation of disease. On the one hand, the very process of identifying a disease or a risk for developing a disease can serve to accelerate the experience of illness and re-interpretation of one's health status; conferring a certain privileged knowledge to medical professionals who specialise in making the invisible processes within the body visible (e.g. Sachs, 1995; Chrysanthou, 2002; Salter et al, 2011). On the other hand, this re-interpreted health status can cause the newly conferred patients to have an increasing ambivalence or anxiety towards the diagnostic information that usually consists of medical images and test results as "objective indicators" of illness rather than on the patients' subjective experiences of the disease or illness (e.g. Martínez, 2005; Blaxter, 2009; Griffiths, Bendelow, Green, Palmer, 2010). Such research illuminates that there is a certain amount of value that people tend to attribute to the subjective experience of feeling that they are ill. A corollary of this attribution of value is that such people may experience a growing resentment towards processes of medicalisation that serve to undermine their subjective experiences. In light of this, the participants in the current study could be seen to have affirmed the value of their experiential knowledge in spite of the possibility that a diagnostic device like the CVD Risk Biochip had the capacity to provide them with information that could alter their health status.

Finally, it is worth noting that the lack of significant differences between the four experimental groups with regards to participants' results on the composite CVD Risk Biochip Body-Relatedness Scale suggests that there was no evidence of distal defences in participants' responses towards the items relating to this dimension. In this regard, following TMT, one might have expected that participants who received either the Self-Esteem Threat task or the Creatureliness Prime or both of these tasks in combination would have been loathe to emphasise the relatedness of the information to be derived from the CVD Risk Biochip to their own bodily experiences. This is because, as discussed earlier, previous TMT research has demonstrated patterns of avoidance of bodily confrontation among participants following the priming of an existential threat (e.g. Cox et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). Additionally, one would have expected that threatening self-esteem or priming the creaturely aspects of the human body would have led participants to undermine their experiential values in favour of the more abstract risk information from the device as a way of avoiding further reminders of

their mortality, following previous TMT research (e.g. Goldenberg et al., 2001; Goldenberg et al., 2002; Goldenberg, 2005; Cox et al., 2007; Goldenberg et al., 2008). However, in opposition to such ideas derived from TMT, it appears that participants in the current study neither sought to avoid the relatedness of CVD Risk Biochip information to their body experiences, nor did they give more status to CVD risk information. This lack of evidence of distal defences provides further support to the proposal that participants in the current study were not existentially threatened by either the Self-Esteem Threat task or the Creatureliness Prime.

Chapter 7: General Discussion and Conclusions

The General Discussion which follows highlights a number of implications of the results of the current programme of research for the broader literature concerning TMT and health threat detection behaviours. In particular, the four sections which follow 1) relate the main results of the four studies in the research programme back to the TMT health threat detection literature, 2) relate these results back to the TMHM, 3) discuss the contribution of the current research programme to a critical examination of TMT and 4) explore the implications of these ideas for the wider literature concerning TMT and health threat detection behaviours, including some recommendations for future TMT research. Two subsequent sections combine some of the findings from the studies in the current programme together in order to present a more complete picture of them. The first of these sections explicitly examines the potential for gender differences among middle-aged participants on the central dependent variables in the current research programme by examining the results of these studies in combination with respect to such potential gender differences. The second of these sections integrates the results of the content analyses of the first three studies with a view to presenting an account of the potential similarities and differences between younger, middle-aged and older adults with respect to their views on death and health-related subjects. Finally, a separate critique is given in relation to the potential limitations of the measurement of DTA in the TMT literature that arose from the current programme of research and strengths and limitations of the current programme of research are more explicitly outlined.

7.1 The Current Research Programme in the Context of Prior TMT Research Concerning Health-Threat Detection Behaviours

As already explored in the Discussion Sections of Chapters 3-6, none of the results of the studies from the current research programme supported the central hypotheses following TMT. More particularly, the findings from Studies 1, 2 and 4 did not support the hypotheses derived from TMT that presenting participants with mortality reminders (e.g. Heart Attack Salience, Mortality Salience or Creatureliness Primes) and distracting them or undercutting their self-esteem (e.g. by presenting them with a Self-Esteem Threat task) would lead them to exhibit defensively avoidant reactions

towards the CVD Risk Biochip. Additionally, the results of Study 3 did not support the central hypothesis that getting participants to complete a Heart Attack Salience task under conditions of cognitive load would lead to increased DTA compared to controls and participants who received a Heart Attack Salience task and subsequent distraction task. The following paragraphs compile these findings from the results of the current programme of research together and relate them back to the previous TMT research on cancer screening behaviours.

The first three studies in the current research programme which included a Heart Attack Salience task failed to replicate Arndt et al.'s (2007) findings in relation to Cancer Salience. These TMT authors had demonstrated that presenting participants with a Cancer Salience task led to an increase in DTA under conditions of high cognitive load compared to participants who received Cancer Salience in combination with a distraction task and those participants who received analogous Control tasks (Study 2 in their research programme). Additionally, in their content analyses of participants' responses to Cancer Salience and Mortality Salience, these authors had found that the former measure elicited a greater number of death-related words and focus on death and survival themes than the latter measure (Studies 1 & 2 in their research programme). From this set of findings, Arndt et al. (2007) had suggested that cancer potentially represents a more existentially threatening construct than thoughts about death, thereby leading to an increase in the suppression of death-related thoughts following Cancer Salience except when an individual is under conditions of high cognitive load. In contrast to the above findings, there were no significant differences between participants who received a Heart Attack Salience or Control task either under conditions of cognitive load or with an accompanying distraction task in the third study. Nonetheless, the results of the content analyses of the first two studies revealed that Heart Attack Salience was just as likely to elicit a high number of thoughts concerning death and focus on death and survival themes as Mortality Salience. This is evidenced by the lack of significant differences on these dimensions between those participants who received a Mortality Salience task and those who received a Heart Attack Salience task and the significant differences on these dimensions between participants who received either of these measure and those who received a Control task.

These results tend to suggest that, while responses to the Heart Attack Salience task may lead to more death-related words and focus on death and survival themes compared to a Control task, this does not appear to translate into an increase in the accessibility of such constructs beyond completion of the task itself. Additionally, Heart Attack Salience and Cancer Salience may not be equivalent measures in terms of their capacity to elicit existential threat, as evidenced by the lack of DTA increases in the results of the third study and the similarity between participants' death-related responses to the Heart Attack Salience task and participants' death-related responses to the Mortality Salience task in the first two studies (i.e. rather than there being significantly fewer death-related responses among participants who received a Mortality Salience task, following Arndt et al., 2007). In sum, the above pattern of results from the current research programme relating to Heart Attack Salience did not replicate Arndt et al.'s (2007) results in relation to Cancer Salience. Furthermore, the results from the current studies do not suggest that thoughts about having a heart attack lead to a sustained and continued suppression of death-related thoughts, as one might have expected following Arndt et al.'s (2007) studies.

The results of the first two studies in the current programme also failed to support the hypothesis following Arndt et al. (2007) that participants in a distal mode of defence would express greater defensive avoidance towards health threat detection behaviours than controls. Specifically, in Study 5 of their research programme, Arndt et al. (2007) had found that male and female participants expressed lower intentions to perform gender-relevant cancer screening behaviours following the receipt of a Cancer Salience task under conditions of high cognitive load compared to controls and those who received a Cancer Salience task and a distraction. In other words, their participants who were in a distal mode of defence expressed lower intentions to perform cancer screening; presumably because such health-oriented behaviours had the potential to threaten their health status. From these results, it had been hypothesised that those participants in the current research programme who were given either a Mortality Salience task or a Heart Attack Salience task to complete (i.e. those participants who could be seen to have been in a distal mode of defence) should have exhibited a greater amount of defensive avoidance to the CVD Risk Biochip due to their increased accessibility of death-related concepts, leading to lower behavioural intentions to use the device. It is important to note here that one would have expected

those participants who completed a Heart Attack Salience task and a subsequent distraction to have exhibited distal defences, in contrast to the participants from Arndt et al.'s (2007) studies who received Cancer Salience and a subsequent distraction who had been deemed to be in a proximal mode of defence. This is because Heart Attack Salience elicited a similar amount of death-related thoughts and focus on survival themes as Mortality Salience among participants in the content analyses of participants' responses in the first two studies of the current programme. In this way, Heart Attack Salience and a distraction should have led to a distal defensive response in the same fashion as Mortality Salience and a distraction or Cancer Salience and a high cognitive load. However, neither those participants in the first two studies who were given a Heart Attack Salience task nor those who received a Mortality Salience task expressed lower intentions to use the CVD Risk Biochip in this way.

It can be surmised from the above that the results of the first two studies appear to differ from Arndt et al.'s (2007) findings. While this apparent lack of defensive avoidance following Heart Attack Salience may have resulted from a lack of sustained suppression of death-related thoughts following thoughts of having a heart attack (as per the results of Study 3 of the current programme that were described above), one would still have expected that Mortality Salience and a subsequent distraction might have led to an increase in defensive avoidance. This is because defensive avoidance responses towards body-oriented health threat detection behaviours have typically been found among participants who were in a distal mode of defence in previous TMT research (e.g. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). However, this was not supported by the results of the current study. In other words, there was no evidence for distal defensive avoidance towards the CVD Risk Biochip following Mortality Salience and a distraction.

Since the design of the fourth study in the current research programme was also partly analogous to Study 1 from Goldenberg et al. (2008) and Study 1 from Goldenberg et al. (2009), it is interesting to note that the results of the former study also failed to replicate the findings from these TMT studies. Study 1 from Goldenberg et al. (2008) had demonstrated that providing creaturely reminders and a Mortality Salience task followed by a distraction led younger women to reduce their intentions to conduct breast self-exams compared to younger women who were given a human uniqueness

reminder in conjunction with a Mortality Salience task and a subsequent distraction. Similarly, Study 1 from Goldenberg et al. (2009) had found that highly neurotic younger women were less willing to imagine undergoing a mammogram after they had received a Mortality Salience task and a creaturely reminder followed by a distraction compared to highly neurotic younger women who had received a Mortality Salience task and a human uniqueness reminder followed by a distraction. Study 4 from the current research programme followed a similar design to these two studies. However, instead of initially presenting participants with a Mortality Salience or a parallel Control task, participants in this study were given either a Self-Esteem Threat or a Self-Esteem Bolster task. As with the previous TMT studies, these measures were then followed by either a Creatureliness Prime or a Uniqueness Prime and a subsequent distraction before being participants were introduced to the information pertaining to the CVD Risk Biochip and subsequent appraisal questions. This minor alteration in design to the similar studies by Goldenberg and colleagues (2008; 2009) should not be seen to constitute a substantial methodological change from the perspective of TMT. This is because previous TMT research has found that threatening an individual's self-esteem can lead to similar effects to Mortality Salience (e.g. Hayes et al., 2008; Routledge et al., 2010), that low state self-esteem can make one more vulnerable to the effects of existential anxiety (e.g. Greenberg et al., 1992b; Greenberg et al., 1993; Harmon-Jones et al., 1997; Van Den Boss, 2001; Hart et al., 2005; Schmeichel et al., 2009; Routledge et al., 2010) and that pervasive self-esteem deficits in an individual can lead to the elicitation of more vigorous TMT-related defences (e.g. Simon et al., 1996; Goldenberg et al., 1999; Goldenberg et al., 2009). In spite of this, there was no evidence of a reduced intention to use the CVD Risk Biochip among participants who received the Creatureliness Prime in combination with a Self-Threat task and a subsequent distraction compared to any of the other groups. Consequently, it can be inferred from this that the results of the fourth study did not provide any further support for the findings of the prior research studies by Goldenberg and colleagues (2008, 2009).

7.2 The Current Research Programme in the Context of the TMHM

The following section relates the results of the four studies in the current research study to the three main propositions that were laid out by Goldenberg & Arndt (2008) in their TMHM. As outlined in Chapter 2 (page 1-29 - 1-30), the central idea behind

the TMHM is that an individual will utilize either the most appropriate proximal defence strategy or the most appropriate distal defence strategy to defend against mortality reminders depending on the individual's level of conscious awareness of the reminders and the availability and relevance of appropriate proximal and distal defence strategies for them. The paragraphs which follow explore the research questions and findings of the four studies in the current research programme in specific relation to the three central propositions of the TMHM.

While none of the studies in the current research programme set out to explicitly test the first proposition of the TMHM relating to proximal defence strategies, the central research question in Study 3 could be seen to relate strongly to this proposition. The first proposition of the TMHM contends that an individual will engage in either threat-avoidance or health-oriented behaviours towards conscious mortality reminders depending on which of these proximal defensive strategies most effectively removes mortality reminders from their conscious awareness. In this regard, Goldenberg & Arndt (2008) proposed that the prior research of Arndt et al. (2007) was evidence for the proximal defence strategy of threat-avoidance. Specifically, Arndt et al. (2007) had found that the very threatening nature of thinking about cancer led to a continued suppression of death-related thoughts for participants in their Cancer Salience conditions after a distraction task and that placing participants under conditions of increased cognitive load prevented this suppression process from occurring. Goldenberg & Arndt (2008) argued that these results supported the hypothesis that individuals will suppress the connection between a grave health threat and its accompanying mortality reminders. In a similar fashion, Study 3 in the current research programme sought to investigate the degree to which participants might suppress the connection between heart attacks and death-related thoughts; a health threat which could be considered to be comparable to cancer with respect to its life-threatening nature. More particularly, this study set out to explore whether or not participants who received a Heart Attack Salience task would continue to suppress thoughts about having a heart attack after they were given a subsequent distraction task compared to control participants and participants who received a Heart Attack Salience task to complete under conditions of high cognitive load. However, the results of this study did not support the suggestion that participants would suppress the associations between heart attacks and their mortality as there were no significant

differences between any of the experimental conditions in this study. As such, the findings of Study 3 failed to support Goldenberg & Arndt's (2008) hypothesis following proposition one of the TMHM that threat-avoidance (i.e. suppression of the links between heart attacks and mortality) would be the most effective proximal defence against a grave health threat such as heart attacks. Consequently, the first proposition of the TMHM was not upheld by the results of the third study.

In line with proposition one of the TMHM; it could also be argued that the CVD Risk Biochip Information Sheet primed proximal defensive responses in the responses of participants from Studies 1, 2 and 4 towards the device. As discussed extensively in the Discussion Section of Chapter 3 (pages 1-85 - 1-87), participants may have reacted against the mortality reminders in the CVD Risk Biochip Information Sheet by using the availability of the CVD Risk Biochip as a means to distract themselves from their potential vulnerability to the potential risk of obtaining a diagnosis of CVD. However, as already outlined, this explanation does not appear to make sense for a number of reasons. Most pertinently for the current critical examination of TMHM, one would expect that a threat-avoidance proximal defence strategy would be a more effective way of removing mortality reminders from conscious awareness than a health-oriented proximal defence strategy which has the potential to provide the existentially-threatening news that one has CVD. This is because the first proposition of the TMHM contends that the individual will select either threat-avoidance behaviours or health-oriented behaviours as a proximal defensive strategy, depending on which of them is most effective at removing mortality reminders from cognisance. However, as the mean attitude and behavioural intention scores towards the CVD Risk Biochip and the likelihood of committing to use the device appeared to represent a health-oriented response for participants in Studies 1, 2 and 4 of the current research programme irrespective of their experimental group, the first proposition of the TMHM does not appear to be supported by the results of these studies.

The first two studies in the current research programme had been designed to explicitly test whether or not older or middle-aged participants would exhibit defensive avoidance responses towards the CVD Risk Biochip when mortality reminders were just below their conscious awareness. As outlined in Chapter 2 (page

1-30), this relates to the part of proposition two of the TMHM which states that health-oriented or risky health behaviours will be adopted by an individual to the extent that such behaviours serve to either boost their self-esteem when mortality reminders are just below their conscious awareness or protect them from the damaging effects to self-esteem that such reminders might engender (Goldenberg & Arndt, 2008). In the current scenario, defensive avoidance would appear to be an effective distal defence strategy of maintaining self-esteem in the face of receiving a very threatening health status. In support of this, many studies from the health psychology literature have shown that people often display patterns of defensive avoidance towards particular health-oriented behaviours that could threaten their health status (e.g. Jemmott et al., 1986; Cameron, 1997; Luce & Kahn, 1999; Kahn & Luce, 2003; Brett et al., 2005). Within the context of the CVD Risk Biochip, defensively avoidant behaviours could be seen to undercut the potential blow to an individual's self-esteem that could result from the receipt of an indication that they are at risk for developing CVD. Despite this, there was no evidence that defensive avoidance occurred following the presentation of either a Mortality Salience task or a Heart Attack Salience task and a distraction compared to control participants in either of the first two studies in the current research programme. Consequently, the suggestion derived from proposition two of the TMHM that participants would display a defensively avoidant response towards the CVD Risk Biochip following mortality reminders that were below consciousness as a way of protecting themselves against a negative blow to their self-esteem was not supported by the results of these studies.

In a similar fashion, one of the central research questions in Study 4 of the current research programme related to the part of the second proposition of the TMHM that suggests that an individual should engage in health-oriented or risky health behaviours which protect them against potential blows to their self-esteem when mortality reminders are just outside of their current conscious focus. More specifically, this particular study examined a corollary of this proposition; i.e. whether or not explicitly providing an individual with a potential blow to their self-esteem and subsequently distracting them would make them more avoidant of the CVD Risk Biochip due to its potential to uncover a potentially life-threatening result. Once again, however, this derivation of the second proposition of the TMHM was

unsupported by the results of the fourth study, which found no significant differences in participants' responses to the attitudes, behavioural intentions or behavioural commitment measures concerning the CVD Risk Biochip depending on whether they were presented with a self-esteem enhancing task or a self-esteem threatening task and subsequently distracted.

One could also argue that the relatively subtle mortality reminders in the CVD Risk Biochip Information Sheet may have elicited a distal defence of health-protective responses among all participants from Studies 1, 2 and 4 (i.e. positive appraisals, increased behavioural intentions and commitments to use the device) that reflected meaning-orientation on their behalf. In particular, the subtle mortality reminders in this sheet could have increased a participant's support for the cultural worldview of scientific progress (e.g. as per Becker, 1975; Rutjens et al., 2009; Rutjens et al., 2010). This follows the portion of proposition two of the TMHM that suggests that an individual may engage in health-oriented behaviours after receiving mortality reminders and a subsequent distraction if these behaviours allow the individual to position themselves as an important contributor to a cultural worldview. Nevertheless, as previously discussed in depth in the Discussion Section of Chapter 3 (see pages 1-87 - 1-89), this proposition is unlikely to have occurred in the current research programme for a number of reasons. Principally, it is unlikely that the subtle mortality reminders would be particularly threatening to participants who read the CVD Risk Biochip Information sheet unless they had already completed either a Heart Attack Salience task or Mortality Salience task. This is because prior health psychology research has found that general mortality reminders such as prevalence estimates often tend to be psychologically minimised by people (e.g. Croyle & Sande, 1988; Van Steenkiste et al., 2004; Peretti-Watel et al., 2007). Additionally, prior TMT cancer-screening research (Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) involved similar general mortality reminders and found that participants only reacted towards these mortality reminders after having been specifically primed with a personal mortality reminder. That is to say, general mortality reminders should not normally invoke a defensively avoidant response among individuals unless they have already received a more personal mortality reminder, as they may be more likely to minimise the importance of this information. Moreover, a distal defence which

allows the potential for one to receive an existentially threatening health status would appear to be an ineffective distal defence strategy.

Finally, the third proposition from TMHM was explicitly examined in Study 4 of the current research programme. The primary hypothesis relating to this proposition is that an individual will seek to avoid body-oriented health behaviours (e.g. health screenings) when reminders of mortality relating to the physical or creaturely aspects of humans are just below their conscious awareness. Use of the CVD Risk Biochip constitutes the performance of a body-oriented health behaviour since the device would require the user to confront the physicality of their bodies by getting them to take a blood sample from themselves and drawing their attention towards whether or not certain cardiac markers are present in this blood sample. Following this observation, the third proposition of the TMHM was tested in the fourth study by giving participants a Creatureliness Prime or a Uniqueness Prime and a subsequent distraction task before presenting them with information pertaining to the CVD Risk Biochip and assessing their attitudes, behavioural intentions and commitments to using the device. The lack of significant differences between the responses of participants who received the Creatureliness Prime and participants who received the Uniqueness Prime on these measures led to a rejection of the third proposition in this instance. Likewise, as discussed in Chapter 6 (pages 1-192 - 1-194), these non-significant results apparently contradict Goldenberg's (2005) proposal that the human creatureliness construct may be particularly relevant to health-orienting behaviours that involve a degree of confrontation with the human body.

7.3 Contribution of the Current Research Programme to a Critical Examination of TMT

As is evident from the two preceding sections, the results of the four studies in the current research programme failed to support either the presence of processes and defences that had been demonstrated in previous analogous TMT research on cancer screening (i.e. Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) or the principal propositions behind Goldenberg & Arndt's (2008) TMHM. While some alternative explanations for the non-significant findings from each of these studies with respect to TMT have been discussed separately in Chapters 3-6, potential global reasons for these effects have yet to be discussed in relation to the wider context of

the research programme taken as a whole. A global approach to these non-significant TMT-related findings may be enlightening as some of the explanations for these results that have been reported thus far have been confined to individual studies. For instance, one of the principal explanations for the non-significant results relating to the first study was that the moderating effect of age on death anxiety may have served to reduce the impact of Mortality Salience or Heart Attack Salience on participants' subsequent attitudes, behavioural intentions and behavioural commitments towards the CVD Risk Biochip in that study. However, since none of the three studies which followed demonstrated significant differences between middle-aged or undergraduate participants who received a mortality reminder and those who received a Control task on any of the main dependent variables, this explanation for the results of the first study can be rejected. The section which follows provides a critical examination of some potential global reasons for the lack of significant differences among the main dependent variables in this research programme.

One potential explanation for the lack of significant differences between the groups in Studies 1, 2 and 4 of the current research programme on the main dependent variables of attitudes and behavioural intentions relates to the potential for hypothetical bias concerning the CVD Risk Biochip. More particularly, one could argue that hypothetical bias may have had an impact on participants' responses to these measures because their potential contact with the device was seemingly remote and thereby did not constitute a sufficient threat to them to warrant a defensive reaction (as per Ajzen et al., 2004). Although this explanation is supported in each of these studies by the consistent findings of a negative skew in the behavioural intentions and attitudes data, it appears to be unlikely for a number of reasons. Firstly, participants in these studies had been assured that the device was a real tangible device that was intended for retail use before they had been presented with these dependent measures. Such an assurance may have served to reduce hypothetical bias relating to thoughts about the device. Additionally, negatively skewed results are often associated with attitude and behavioural intention scales in health-related research (e.g. Tabachnick & Fidell, 2001), so there is no reason to suggest that such a pattern of results in the current study were specifically related to hypothetical bias. Furthermore, this explanation fails to account for the fact that participants in several prior TMT studies had displayed significantly different responses towards various hypothetical health

behaviour scenarios when they were asked to think about their own mortality rather than when they were asked to think about a control topic such as dental pain (e.g. Hirschberger, et al., 2002; Arndt et al., 2003; Routledge et al., 2004; Taubman - Ben-Ari, 2004; Taubman - Ben-Ari & Findler, 2005; Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009; Arndt et al., 2009). For instance, in Taubman - Ben-Ari & Findler's (2005) Study 1, young and middle-aged adults reported a higher willingness to participate in 10 different hypothetical health-oriented behaviours (e.g. changing their diet after getting a high cholesterol test result) following mortality reminders and a subsequent distraction compared to young and middle-aged adults who received a control topic and the same distraction. Older adults who received mortality reminders and a distraction also tended to show a significantly lower willingness to participate in the hypothetical behaviours compared to older adults who received a control topic and a distraction. Following this finding that hypothetical scenarios concerning health-related behaviours can elicit different reactions even among older adults depending on whether they have received mortality reminders or a control topic and a subsequent distraction, one would have expected to see patterns of significant differences in Studies 1, 2 and 4 between participants who received mortality reminders and participants who received a control task on their attitude and behavioural intentions towards the CVD Risk Biochip.

Similarly, an explanation that hypothetical bias may have interfered with participants' reactions to the CVD Risk Biochip does not account for the finding that receiving mortality reminders or a control topic and a subsequent distraction did not add to the predictive power of how likely a participant was to respond to the De Facto Intentions measure. This measure had been explicitly designed to address the issue of hypothetical bias by giving participants the option to sign up for a potential CVD Risk Biochip pilot study, thereby allowing them to be relatively certain that the device itself existed and providing them with the opportunity to commit to using the device in the future. In this way, receipt of mortality reminders and a distraction should have at least added to the prediction of how likely a participant was to sign up to the CVD Risk Biochip pilot study in the absence of significant differences between the groups on the other dependent variables, given that so many other TMT studies have demonstrated significant differences in responses towards health-relevant behaviours between groups who received either a mortality reminder or a control

measure (e.g. Taubman - Ben-Ari et al., 1999; Taubman -Ben-Ari, et al., 2000; Hirschberger, et al., 2002; Arndt et al., 2003; Taubman - Ben-Ari & Findler, 2003; Routledge et al., 2004; Taubman - Ben-Ari, 2004; Taubman - Ben-Ari & Findler, 2005; Arndt et al., 2007; Goldenberg et al., 2008; Jessop et al., 2008; Arndt et al., 2009; Goldenberg et al., 2009; Hansen et al., 2010; Martin & Kamins, 2010). In light of these features of Studies 1, 2 and 4 in the results of the current programme, hypothetical bias seems to be an unlikely explanation for the pattern of non-significant and highly positive results that had been found in those studies.

An alternative explanation for the lack of significant differences between the groups in these studies is that the attitudes and behavioural intentions scales may not have sufficiently tapped into participants' attitudes and behavioural intentions towards the device. Nonetheless, this explanation also seems unlikely as the two scales that had been developed specifically for this study were derived from two standardised health scales, which were drawn from the health psychology and TMT literature (see pages 1-60 - 1-61). Specifically, the attitude scale used in both studies drew on questions from the well-established KHOS (Krantz et al., 1980), reformulated them and added additional questions so that the content was broad enough to cover a range of aspects of participants' attitudes towards the CVD Risk Biochip, including their emotional reactions towards the device, evaluations of its usefulness and attitudes towards diagnostic testing for patient use more generally. The behavioural intentions scale was also an adaptation of a standardised scale; "the breast self exam intention questionnaire", that had been previously used in the TMT literature (e.g. Arndt et al., 2007; Goldenberg et al., 2008). It is important to note that participants from those prior TMT studies gave significantly different responses towards items on "the breast self exam intention questionnaire" depending on whether or not they received a mortality reminder (e.g. Mortality Salience, Cancer Salience or a Creatureliness Prime) or a control measure. The adaptation of this scale for the relevant studies of the current research programme remained quite close to the content of the items in the original scale, but substituted questions relating to breast self exam screening for questions pertaining to using the CVD Risk Biochip. It follows that the items in both of these scales, which had been developed specifically for the current research programme, appear to have covered quite a broad range of content concerning attitudes and behavioural intentions towards the CVD Risk Biochip. As a result, these

scales are likely to have sufficiently tapped into participants' attitudes and behavioural intentions towards the device. In support of this suggestion, the majority of participants from these studies who completed the questionnaire spontaneously discussed how they felt that the device was of great benefit after they had completed the questionnaire, suggesting that the overwhelming positive responses to the device probably reflected participants' genuine attitudes and behavioural intentions towards the device, irrespective of their condition.

It is also possible that the negative skew and lack of significant differences between the groups in the results of Studies 1, 2 and 4 arose from a demand characteristic, where participants felt obliged to respond in a positive manner towards the device. There are a number of reasons to suggest that this explanation is unlikely. Firstly, participants were explicitly asked to give their gut-level reactions to each of the items in the Questionnaire Booklets in the instructions at the front of these booklets and they were specifically encouraged to give their own personal responses to the behavioural intentions and attitude questions. Participants had also been ensured that all of the information in the questionnaire would be kept anonymous and confidential at the outset of the study and that there would be no way that anyone would be able to identify individual participants by their answers alone. Additionally, despite the fact that the majority of participants' evaluations of the device were positive, there were several participants in each of the studies whose responses indicated that they were ambivalent towards the CVD Risk Biochip. Many other participants indicated that they thought that the device was useful but that that they had no particular desire to use it in the future or that they did not wish to sign up for a pilot study where they would be required to use the device on themselves. Such responses are unlikely to reflect a demand characteristic, as they appear to reflect realistic responses towards the device.

Moreover, discussion with participants during the debriefing sessions indicated that many of them had very specific opinions as to why they considered the CVD Risk Biochip to be useful. For example, several participants indicated that they were familiar with the blood glucose monitors used by diabetics to self-monitor their condition. These individuals considered the CVD Risk Biochip, which works on a similar principle, to have great potential utility due to their impressions of the success

of these blood glucose monitors. Such considered responses would suggest that participants were not positively appraising the device by default. Finally, one would have expected participants to have responded more negatively to the De Facto Intentions measure in these studies if participants had biased their answers to items on the attitudes and behavioural intentions scales (i.e. since this measure reflects a certain amount of behavioural commitment to using the device in the future and could therefore be seen as a more implicit measure of participants' personal appraisals of the device). However, since most of the participants in these studies signed up to the pilot study, it would appear unlikely that participants' responses to the attitudes and behavioural intentions measures demonstrated a demand characteristic.

A further explanation for the non-significant results in the current research programme may have been a generalised lack of existential threat among Irish participants. As previously noted in the Discussion Section of Chapter 6 (pages 1-198 - 1-199), Irish people may not react strongly to blows to their self-esteem due to a cultural behavioural pattern of self-deprecation (e.g. Crotty, 2006; Inglis, 2006) and they may not find creaturely reminders to be as existentially threatening as those American participants who have participated in prior TMT research involving this method (e.g. due to their historical dealings with racial slurs that have involved likening them to animals; Earls, 1988; Curtis, 1997; Orser Jr., 1998; Mullin, 1999; Engle, 2001; Knobel, 2001; Hinds, 2004; Lloyd, 2005; Soper, 2005). Furthermore, there is reason to suggest that Irish participants may be less prone to existential anxiety or fears of death due to a cultural heritage where death is openly discussed. Following Becker, TMT authors have assumed that there is an elaborate death-denying function in all cultural worldviews (e.g. Solomon et al., 1997). Indeed, Becker himself suggested that it is the repression of death that allows an individual to feel secure; "The great boon of repression is that it makes it possible to live decisively in an overwhelmingly miraculous and incomprehensible world, a world so full of beauty, majesty, and terror that if animals perceived it all they would be paralysed to act" (1973; p. 50). However, such an argument does not sufficiently account for cultures where death is explicitly represented and openly discussed among its cultural proponents.

The Irish cultural heritage appears to include such a characteristic acceptance of death. For instance, in an anthropological study of wake and funeral customs in Co. Tyrone, Cashman (2006) noted how Irish "wakes" point towards a cultural tradition which embraces death as an important transitional phase in the life cycle. Wakes typically involve a social gathering following a funeral, where people celebrate the life of the deceased person while the body lies nearby in an open casket. The transitionary focus of such gatherings typically involves the exchanging of anecdotes about the deceased person in order to simultaneously invoke their presence, celebrate their lives and bid them farewell (Cashman, 2006). Indeed, the term "wake" evokes this transitionary emphasis itself with its implication that the mourners seek to invoke the spirit of the dead person and involve them in the proceedings. Additionally, while it has been noted that the traditional purpose of a wake was to watch the body during the period of time between death and burial, Irish wakes came to be regarded as social events which often involved playing games, drinking and story-telling (Harlow, 1997). This would appear to suggest that the process of death and dying is not necessarily inherently tied with sadness, fear or mourning for the Irish. On the contrary, this symbolic Irish cultural ritual appears to embrace death and dying as a natural part of everyday life and even celebrates death as a time to reflect on the value of the dead person (O'Gorman, 1998). There is also evidence that death has been included in everyday practices for thousands of years in Ireland. For instance, early Irish settlers often incorporated the remains of the dead in structural post- and stake-holes, ditches and even walls as a way of symbolically tying the living to the land their kin once inhabited (Cleary, 2005). It has even been argued that the traditional placement of cemeteries may have acted as a way of asserting ownership over a particular area by Irish settlers dating back to the Bronze Age (Cleary, 2005).

Such practices tend to imply that there has traditionally been a great respect for the dead among the Irish and that death was even once incorporated into everyday ritual practices. Sinead Donnelly's (1999) phenomenological enquiry into the processes of dying and folklore associated with dying in the West of Ireland provides further support for the suggestion that the Irish cultural heritage embraces death through her findings of a great respect for the dead and acceptance of the processes involved in death and dying among local people from the north-west, west and south-west of the country. In her series of unstructured interviews with over 30 locals from these areas

over a six-month period, she found that the moment of death for a dying person in care was particularly sacred, involving silent recitations of prayer and candle-lighting by the dying person's bedside rather than more personal expressions of grief and anguish towards their death. The interviewees also indicated that they felt that it was important for young people to be familiar with death and to realize its naturalness. This acceptance of death appeared to allow carers to help the dying person to "enter into the presence of God". Indeed, the gradual and prepared death has been traditionally seen as a "good death" among the Irish; whereby the dying person is allowed to settle their spiritual and earthly affairs, ending in the death-bed scene with the family gathering round (Taylor, 1989).

Many Irish people also appear to find humour in the subject of death. In this regard, many qualitative accounts have suggested that Irish people commonly joke about their own deaths, dead bodies or the dead that they are mourning (e.g. Messenger, 1978; Taylor, 1989; Harlow, 1997; Donnelly, 1999; Cashman, 2006). Interestingly, there are even accounts of wakes involving practical jokes such as the "re-animation of the dead body", where a dead body was made to move as though alive in order to provide some humour and shock to the proceedings (Harlow, 1997). Such practical jokes may appear shocking and disrespectful towards the dead for those who are not from Ireland. Nonetheless, they are in keeping with the transitionary focus of the tradition of "waking the dead person" at such occasions and appear to reflect an Irish attitude of humour in the face of death.

The above accounts suggest that Irish culture has traditionally involved a certain amount of openness and acceptance in relation to death. Such openness and focus on death-related matters appears to contrast starkly with the principal propositions of TMT that culture provides people with a sense of symbolic immortality that allows them to temporarily "deny death" by associating themselves with systems of valued ideas and practices that have the capacity to outlive them (e.g. Greenberg, et al., 1986). This Irish characteristic of openness would also seem to contradict Becker's assertion that "everything that man does in his symbolic world is an attempt to deny and overcome his grotesque fate" (p. 27; 1973). This is because, the Irish cultural heritage of openness in the face of death appears to involve a certain embracing of the concept of death, rather than attempts to repress or deny it. In other words, death may

not have to be repressed or sublimated by Irish people as they have culturally acceptable ways of dealing with the concept openly.

A central implication of this cultural acceptance of death is that Irish people tend to be less afraid of death itself and more concerned with how one might die. This very idea is reflected in a recent national survey on Irish views on death and dying involving 667 participants which has demonstrated that most Irish people may be more concerned with the quality of their dying than death itself (McCarthy, Weafer & Loughrey, 2010). This idea would also appear to account for the seeming lack of existential anxiety experienced by younger, middle-aged and older adults in each of the studies in the current research programme in relation to any of the mortality reminders (i.e. receipt of a Mortality Salience, Heart Attack Salience, Creatureliness Prime or Self-Esteem Threat task) presented to them. In other words, the Irish participants in each of these studies who were presented with mortality reminders may not have experienced existential anxiety due to their attitude of openness and acceptance in the face of death as a result of their cultural heritage. This lack of existential anxiety may then have manifested in the non-significant differences on the main dependent variables in these studies between those participants who received mortality reminders and those who did not. In sum, Irish participants may not be as vulnerable to the effects of existential anxiety that have been uncovered in other TMT studies as a result of their openness in discussing death-related ideas, rather than making attempts to deny or repress such ideas.

In support of this proposition, one of the only published TMT studies involving a sample of participants from the Republic of Ireland (Carey & Sarma, 2011) contradicted previously TMT-related research involving risky driving behaviours among young adult males. While these researchers found evidence that priming mortality-related information related to risky driving led to increases in intentions to take driving risks among young adult males compared to priming neutral information concerning driving, they also found that priming the mortality-related information did not lead to increases in driving-related self-esteem among these adults compared to controls. This finding departs from previous TMT research on risky driving behaviours, which had found that mortality reminders led to higher intentions to perform risky driving and higher risky driving behaviours on a driving simulator

among younger adults only when driving was relevant to their self-esteem (e.g. Taubman - Ben-Ari et al., 1999; Taubman - Ben-Ari, 2000). Such a finding also departs from the contention of TMT researchers that mortality reminders tend to lead to increased efforts to enhance self-esteem (e.g. Greenberg et al., 1994; Harmon-Jones et al., 1997; Pyszczynski et al., 1999; Pyszczynski et al., 2000; Goldenberg & Arndt, 2008). Furthermore, Carey & Sarma (2011) found impulsiveness to be a significant predictor of their participants' intentions to take driving risks. Since impulsiveness has been found to be strongly associated with sensation seeking, risk taking, novelty seeking, boldness, adventuresomeness, boredom susceptibility, unreliability, and unorderliness (e.g. Depue & Collins, 1999), the supposedly TMT-related effect of increased intentions to take driving risks following receipt of mortality reminders may have related more to participants' heightened arousal from the mortality-related risky driving information than from their attempts to enhance their self-esteem.

There was only one other published study with participants from the Republic of Ireland found in a literature search for TMT research and this study did not contain a control group (Hughes & Black, 2006; a study involving the association between body esteem and cardiovascular stress reactivity towards cadaver dissections among medical students). The lack of a control group in this study means that it is difficult to draw conclusions as to whether or not the effects attributed to TMT defences arose as a result of existential anxiety or some other characteristic of the study (in other words, the correlations that were found between body esteem and cardiovascular stress reactivity may have been attributable to a hidden third variable and may not have been necessarily linked to TMT processes). Furthermore, there have been several unpublished studies involving Irish participants that have found no evidence of the effects of existential anxiety on a variety of dependent variables following the predictions of TMT. For instance, three TMT studies conducted by masters and undergraduate students at Trinity College Dublin (two of which involved Mortality Salience and one of which involved the subliminal priming of death-related words) failed to support hypotheses derived from TMT (Professor Malcolm MacLachlan, personal communication, 14th April 2012). This is particularly interesting in light of the findings of a recent meta-analysis of the Mortality Salience Hypothesis in the TMT literature, where little evidence was found of any unpublished TMT studies that

did not support the central hypotheses of the theory (Burke et al., 2010). In this context, the Irish studies that have failed to support TMT processes would appear to add further weight to the proposition that Irish adults may be less susceptible to the TMT-related effects of existential anxiety.

A major advantage of the above explanation is that it has the potential to account for the results of each of the studies in the current research programme, in contrast to many of the previously explored explanations (i.e. which only focused on the results of some of the studies in the current programme, such as Studies 1, 2 & 4 taken in combination). In particular, this explanation has the capacity to explain the findings that there were no significant differences between younger, middle-aged and older Irish adults' responses to a range of dependent variables (DTA, behavioural intentions, attitudes and De Facto Intentions) following mortality reminders (Heart Attack Salience, Mortality Salience, Creatureliness Prime or Self-Esteem Threat tasks) due to their familiarity with openly discussing death. Additionally, this explanation has the capacity to account for the findings of the content analyses of the first three studies that demonstrated that, while both Heart Attack Salience and Mortality Salience led to a significantly greater number of death-related words and focus on death and survival themes compared to a Control task, these measures did not lead to increases in death-thought suppression or defensive avoidance of health threat detection behaviours like using the CVD Risk Biochip; i.e. because mortality reminders may not lead to TMT-related defences among Irish participants.

It should also be noted that this explanation does not necessarily suggest that TMT is invalid, despite the fact that it appears to be opposed to the findings of previous TMT research. This is because the Irish cultural context may be unique in its incorporation of mortality-related concepts into the dominant cultural worldviews. In this regard, O'Gorman (1998), in her sociological analysis of death and dying, has drawn attention to the fact that wakes, funeral customs and the general attitude towards death among Irish people tend to contrast starkly with the scant grief that is typically expressed in contemporary society. On the other hand, concepts relating to death may have already been integrated into the Irish cultural systems of meaning that constitute their CAB (following Solomon et al., 1991) in such a way that they do not need to adopt modes of defence against mortality reminders. That is to say, Irish cultural

representations of death (e.g. images of death as a humorous subject) and the adoption of cultural practices and beliefs that allow the anticipation and acceptance of mortality (e.g. following qualitative research concerning the Irish temperament in the face of death; Messenger, 1978; Taylor, 1989; Harlow, 1997; O'Gorman, 1998; Donnelly, 1999; Cashman, 2006) may have moderated the experience of existential anxiety for the Irish people to such a degree that such anxiety no longer manifests itself. In this way, Irish people may not need to utilise TMT defences in response to mortality reminders in the manner that has been uncovered within the TMT methodological framework. Nonetheless, some of the cultures that have typically been examined in TMT research may have different attitudes or predispositions towards death when compared to the Irish attitudes that are more reflective of TMT mechanisms. For instance, in a highly cited review of cross-cultural accounts of death, Palgi & Abramovitch (1984) have pointed towards a wealth of anthropological research that has suggested that Americans (who have been the primary focus of TMT research to date) may have a particular problem dealing with death and often try to avoid death-related encounters such as meetings with dying or bereaved persons. Consequently, individuals from cultures such as America, who have not explicitly incorporated death into their cultural worldviews in the same manner as the Irish, may need to utilise proximal and distal defences in the face of mortality reminders.

On a slightly separate but related note, the accompanying proposition derived from the recent national survey on Irish views on death and dying that Irish people may be more concerned with the quality of their dying than death itself (e.g. McCarthy et al., 2010) would also appear to account for the fact that the majority of participants in Studies 1, 2 and 4 of the current research programme gave a positive appraisal of the CVD Risk Biochip and gave relatively high behavioural intentions and commitment to using the device in the future. That is to say, these Irish adults' concern with the potential quality of their dying may have provided them with an interest in the device itself that may have over-ridden any potential anxiety that they may have had towards its use, resulting in more positive appraisals towards the device and high behavioural intentions and commitments towards its use. In conclusion, the lack of evidence for significant differences between participants who received a mortality reminder or Control task in their responses to any of the dependent measures in each of the studies in the current research programme and the highly positive appraisals and approach-

oriented responses of participants towards the CVD Risk Biochip would appear to lend support to the idea that the responses of Irish participants in these studies reflected a lack of existential anxiety and greater concern with the quality of their dying.

7.4 Implications of the Current Research Programme for TMT, Future Directions and Applications

The current set of studies failed to support the central hypotheses of the research programme following TMT that mortality reminders would lead to more defensively avoidant responses towards the CVD Risk Biochip. As suggested above, this may relate to the findings from anthropological, historical and sociological studies that Irish people tend to exhibit characteristic openness in the face of death (e.g. Messenger, 1978; Taylor, 1989; Harlow, 1997; Donnelly, 1999; Cashman, 2006; McCarthy et al., 2010) rather than exhibiting death-denying cultural practices, as suggested by TMT (e.g. Greenberg et al., 1986; Solomon et al., 1991; Pyszczynski et al., 2000; Goldenberg & Arndt, 2008). An implication of this idea is that Irish people may not be vulnerable to the effects of existential anxiety that are proposed by TMT. This may also mean that people from different cultures and countries where death is seen in a similar light may not experience proximal and distal defences in the face of mortality reminders in the manner posited by TMT researchers. For instance, TMT-related processes might not work for Mexican people who are said to scorn and laugh at death, are seemingly comfortable in the presence of death and even celebrate death in their annual "Day of the Dead" (e.g. Brandes, 2003). There are currently no reported TMT studies that have taken place in Mexico, but the current pattern of findings and the lack of TMT-related effects in previous research studies involving Irish participants (e.g. Carey & Sarma, 2011; Professor Malcolm MacLachlan, personal communication, 14th April 2012) who also exhibit acceptance and openness towards the concept of death would appear to suggest that Mexicans may not be particularly affected by mortality reminders due to their similar openness towards the subject. If this is the case, TMT effects and processes may not be generalisable to the general population in the ways proposed by TMT researchers (e.g. Greenberg et al., 1986; Solomon et al., 1991; Pyszczynski et al., 2000; Goldenberg & Arndt, 2008). Instead, TMT defences may be limited to cultural groups who have not explicitly incorporated death into their cultural representations or worldviews (e.g. such as

Americans; Palgi & Abramovitch, 1984). Consequently, the external validity of TMT defences may be limited to those cultural groups that have been found to exhibit proximal and distal defences in response to mortality reminders. Similarly, as indicated in Chapter 6 (pages 1-196 - 1-197), the cross-cultural reliability of methods such as Goldenberg et al.'s (1999) Creatureliness Prime may need to be established among cultural groups who may be habituated to creaturely comparisons, such as Africans or American Indians (e.g. Mullin, 1999; Hinds, 2004; Soper, 2005), since individuals from such cultures may not be as existentially threatened by creaturely reminders due to a habituated response to such reminders. Underlining the potential limitations of the TMT research paradigm with such research is important in order to establish the boundaries within which cultural defences towards existential anxiety may operate.

An additional implication arising from the potential moderation of existential anxiety within cultures that have adopted explicit cultural representations of death is that qualitative TMT-related research may need to be conducted on a particular cultural group of interest in order to establish the content of its cultural worldviews before TMT defences may be proposed for that particular cultural group. Thus far most TMT research on cultural worldviews have made assumptions about the particular cultural worldviews that their participants may have rather than investigating the specifics of these cultural worldviews (e.g. Greenberg et al., 1990; Greenberg et al., 1991; Greenberg et al., 1994; Harmon-Jones et al., 1997; Arndt et al., 1997a; Arndt et al., 1997b; Greenberg et al., 2000; Greenberg et al., 2001; Arndt et al., 2002; Schmeichel & Martens, 2005; Schimel et al., 2007; Schmeichel et al., 2009). For instance, one of the most common TMT-related dependent variables (i.e. worldview threat responses towards an anti-American essay) has relied on the assumption that Americans will defend against anti-Americans when they are in a distal mode of defence (e.g. Greenberg et al., 1994; Arndt et al., 1997a; Arndt et al., 1997b; Greenberg et al., 2000; Greenberg et al., 2001; Schmeichel et al., 2009). However, since TMT authors have also emphasised that meaning and values are the most important determinants of an individual's cultural worldviews (e.g. Solomon et al., 1991; Mikulincer & Florian, 2002), it would appear to be particularly important to more specifically illuminate the contents of the meanings and values of a particular culture of interest. Indeed, TMT was originally based on the writings of the cultural anthropologist Ernest Becker who

had specifically outlined the importance of the idiosyncrasies of individual cultures' reactions towards reminders of their mortality that had been established through ethnographic research (e.g. 1973; 1975). Since quantitative methods are typically criticised for their lack of depth, poor validity and shallowness of analysis with respect to meaning-oriented variables (e.g. Karpatschof, 2007), it may be more beneficial for TMT authors to employ qualitative research methods as a way of establishing the meaning and value-related dimensions of particular cultural worldviews before proceeding with theory-testing quantitative research studies. Future TMT-related research programmes that involve the investigation of the contents of cultural worldviews through qualitative methods in this way would have stronger validity with respect to cultural meanings and values and would allow for more specific hypotheses to be developed with respect to cultural worldview defences (or lack of cultural worldview defences as the case may be).

Another major implication of the results of the current research programme is that diagnostic devices like the CVD Risk Biochip may have a beneficial effect on the potential uptake of screening behaviours generally. For instance, the majority of participants in Studies 1, 2 and 4 gave highly positive appraisals of the device and expressed a high amount of behavioural intentions and commitment to use the device. This result appears to suggest that the introduction of POCT diagnostic devices like the CVD Risk Biochip could improve the uptake of screening behaviours generally. Nonetheless, this result also contrasts with the substantial body of previous research in health psychology that has found that people often display patterns of defensive avoidance when they perceive that health threat detection behaviours such as cholesterol tests or cancer-screening could threaten their health status (e.g. Horowitz et al., 1980; Horowitz et al., 1983; Croyle et al., 1993; Millar & Millar, 1993; Cameron & Leventhal, 1995; Millar & Millar, 1995; Cameron, 1997; Mengden et al., 1998; Ketterer et al., 1998; Luce & Kahn, 1999; Newell et al., 1999; Emslie et al., 2001; O'Carroll et al., 2001; Kahn & Luce, 2003; Ketterer et al., 2004; Van Steenkiste et al., 2004; Brett et al., 2005; Arndt et al., 2007; Caldwell et al., 2007; Huerta et al., 2009).

Despite this seeming inconsistency, there are a number of reasons why a device like the CVD Risk Biochip may be different to some of the health threat detection

behaviours investigated in these prior health psychology research studies. For instance, this sort of POCT device appears to give a less imminent indication of a potentially fatal health threat, which may serve to make the device itself appear to be less threatening in comparison to health threat detection behaviours such as cancer-screening or cholesterol tests. By way of explanation, since the CVD Risk Biochip is only purported to give an indication of future risk of developing CVD, participants may have felt that they could have modified their future health behaviours in order to directly reduce their risk for developing CVD. In contrast, cancer-screening behaviours, cholesterol tests or diagnostic tests which indicate the presence or absence of a condition do not appear to allow for the prevention of the associated health condition through the behavioural modification of risk factors to the same degree (e.g. Millar & Millar, 1993; Millar & Millar, 1995; Cameron, 1997). Instead, these behaviours appear to confer a favourable or unfavourable health status that may seem less modifiable. The loss of control associated with the revealing of a potential condition could be one of the motivating factors behind defensive avoidance of health threat detection behaviours such as cancer-screening or cholesterol tests (e.g. in the manner exhibited in the previous TMT studies depicted in Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009). On the other hand, POCT devices like the CVD Risk Biochip, while not health-promotion behaviours per se, could be seen as somewhat closer to health-promotion behaviours due to their capacity to allow for a person to improve their health status. In other words, a POCT device like the CVD Risk Biochip may be qualitatively different from other sorts of health threat detection behaviours in the sense that it does not confer a negative health status to an individual. What may be particularly important about the framing of this sort of health threat detection behaviour is that one has a "risk of developing" a particular condition rather than "having" the condition. In this regard, future research could establish if framing health threat detection behaviours as "risk factor tests" may lead to an improved uptake of such behaviours compared to framing them as diagnostic measures that indicate the presence or absence of a condition.

Furthermore, the fact that such a device does not confer a negative health status to an individual may mean that the development of POCT devices of a similar nature to the CVD Risk Biochip by research institutions like the BDI may actually have a positive effect on the uptake of screening practices. Indeed, the results of the current research

programme tentatively suggest that the availability of devices of this nature that give an indication of the future risk of developing a condition may be beneficial in increasing screening practices more generally as the overwhelming majority of participants in Studies 1, 2 & 4 gave a positive appraisal of the device and indicated their commitment to using the device. This may mean that analogous devices which provide individuals with risk factor estimates for fatal conditions could increase the uptake of screening practices for such conditions. For instance, as there have been recent biomedical advances in the identification of early biomarkers for the development of specific forms of cancer like ovarian cancer (e.g. Raja, Hook & Lederman, 2012), prostate cancer (e.g. Killick, Bancroft, Kote-Jarai & Eeles, in press) and lung cancer (e.g. Liloglou, Bediaga, Brown, Field & Davies, in press), it may be possible to develop POCT devices that give risk factor estimates for the future development of these cancers. The results of the current research programme suggest that such devices may be received more favourably by the general public than secondary screening practices that effectively provide an individual with a cancer diagnosis. It may even be possible to target such POCT devices for use in the home where they could be used for primary prevention (i.e. since modifiable risk behaviours for cancer development have been identified; e.g. Stein & Colditz, 2004). In this way, it may be possible to reduce the morbidity and mortality rates of various conditions such as cancer through the development of POCT devices that indicate early risk of developing such conditions and targeting of such devices for use in primary care settings where they may be used for preventative purposes.

Another reason why use of a POCT device like the CVD Risk Biochip may be different from other health threat detection behaviours is the potential sense of autonomy and independence that such behaviours may offer users. Indeed, there is reason to believe that participants in the current research programme considered this device to be beneficial in its capacity to empower them. Firstly, participants' responses towards the CVD Risk Biochip Body-Relatedness Scale in Study 4 indicated that they did not find diagnostic devices like the CVD Risk Biochip to be disassociated or disconnected from their bodily experiences. This would seem to imply that these participants felt that they would be able to incorporate the risk information that a device like the CVD Risk Biochip provides into their understanding of their own physical health and their bodies. Additionally, as

previously mentioned in Chapter 6 (pages 1-203 - 1-205), participants' low mean scores in relation to the item "Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body" in Study 4 would appear to suggest that they valued their sense of experiential knowledge from their bodies to at least the same degree as the risk information to be gained from devices like the CVD Risk Biochip. When these results are taken in combination with the high positive appraisals of the CVD Risk Biochip and high behavioural intentions and commitments to use the device among participants in the current research programme, they appear to suggest that these participants may have found the CVD Risk Biochip to be useful in its potential to empower them. That is to say, participants may have found the CVD Risk Biochip to be particularly favourable as it could afford them with the opportunity to make their own health decisions by combining their own experiential knowledge with "objective indicators" of illness from the device. Such ideas appear to tally with previous research on the use of POCT devices by nurses and patients that has indicated that such devices can give such users a sense of empowerment as they can obtain results quickly and act on them directly without having to directly ask the advice of a physician or trained laboratory professional (e.g. Hicks, 2004; Spriggs, 2004). In particular, devices such as the blood glucose monitors used by diabetics have been found to afford patients with a sense of control over their own health status (Spriggs, 2004). In a similar fashion, POCT health threat detection devices such as the CVD Risk Biochip could provide individuals who are potentially at risk for developing CVD with the capacity to monitor their condition; thereby endowing them with a sense of autonomy in relation to their health. Future research could establish whether or not the apparent autonomy afforded by POCT devices like the CVD Risk Biochip could improve their uptake in comparison to other forms of risk factor tests such as cholesterol tests or central laboratory research testing that are conducted by a trained professional.

To conclude, there are a number of striking implications of the current research programme. Firstly, the priming of mortality reminders does not appear to elicit defensive responses among Irish participants, suggesting that TMT processes may not be cross-culturally reliable and that qualitative investigations of the contents of the meanings and value-oriented dimensions of cultural worldviews may be needed in

future TMT research. Secondly, POCT devices such as the CVD Risk Biochip appear to encourage approach-oriented responses among participants in comparison to other sorts of health threat detection behaviours like cancer-screening or cholesterol-testing. This may result from the fact that devices like the CVD Risk Biochip have the capacity to provide a less immanent indication of a potentially fatal health threat and have the potential to endow lay individuals with a sense of autonomy in relation to their health by allowing them to test themselves and monitor their condition. Thirdly, it may be particularly important to frame such POCT devices as having the capability to give an indication of "risk" for developing a condition in order to prevent defensively avoidant responses among individuals in response to potential threats to their health status. Finally, it may also be important to encourage autonomy in relation to the use of such devices as lay people appear to put a substantial amount of value into their own experiential knowledge of health and illness.

7.5 Gender Differences among Middle-aged Participants

As explored in the Discussion Section of Chapter 4 (pages 1-120 - 1-121), there was partial support in Study 2 of the research programme for the hypotheses that middle-aged male participants would be less likely to commit to using the CVD Risk Biochip in a proposed pilot study and would display more negative appraisals of the device compared to middle-aged female participants. Specifically, these results support some of the data from the health psychology literature that has found that men tend to participate in a greater number of behaviours that are damaging towards their health than women (e.g. Huselid & Cooper, 1992; Garrison et al. 1993; Stillion, 1995; McCreary et al., 1999; Centers for Disease Control and Prevention, 2000; Courtenay, 2000a; Courtenay, 2000b; Taubman - Ben-Ari & Findler, 2003; McCreary et al., 2005; Cotto et al., 2010), that women tend to engage more frequently in health-oriented behaviours and tend to have more knowledge of health concerns than men (e.g. Liang, et al., 1999; Van Wijk, 1999; Brunswick et al., 2001; Wardle et al., 2001; Janda et al., 2004; Parslow et al., 2004; Evans et al., 2005) and that men tend to exhibit more avoidance of health-oriented behaviours compared to women (e.g. Liang, et al., 1999; Tamres et al., 2002; Parslow et al., 2004; Evans et al., 2005). The results of Study 1, which found that both male and female older adults provided highly positive appraisals of the CVD Risk Biochip and did not express any significant differences in their attitudes or behavioural commitments towards its use,

also conformed to the findings of previous health psychology research which had found that patterns of gender differences in health-oriented behaviours tend to decrease among older adults (e.g. Stoller & Pollow, 1994; Airey et al., 1999; Liang et al., 1999; Tseng & Lin, 2008; Apostolidis et al., 2009). However, this pattern of results did not appear to be supported in the results of Study 4, where there was no significant impact of the gender covariate on participants' behavioural intentions or attitudes towards the CVD Risk Biochip and gender did not appear to contribute to the odds of whether or not a participant chose to sign up for the proposed pilot study. Nonetheless, when taken together, the pattern of results from the current research programme relating to gender differences in health-seeking and health-related behaviours provides some moderate support for some of the health psychology literature relating to this topic. This moderate support for gender differences suggests that the design of future TMT research involving health-related behaviours may need to take account of such differences.

7.6 Content analyses of the Salience Measures from First Three Studies

In addition to the gender differences with respect to the main dependent variables in the current research programme, there were a number of similarities and differences between the responses of younger, middle-aged and older adults in the first three studies with respect to their open-ended responses to the salience measure. One notable consistency across these studies was observed with respect to the "number of death-related words used" and the "degree of focus on death and survival themes" in participants' responses towards the Heart Attack Salience task. Specifically, the results of the content analyses of the first three studies taken together revealed that getting participants to think about having a heart attack was significantly more likely to elicit thoughts of death and survival on these dimensions than thinking about dental pain. Such a pattern of results is illuminating as it suggests that participants in this study considered having a heart attack to be a death-related event. In this way, it does not appear likely that thinking about heart attacks failed to elicit thoughts about death, survival and related themes among participants. On the contrary, these findings indicate that thinking about having a heart attack results in increased thoughts of death and an increased focus on death and survival themes, irrespective of an individuals' age or whether or not they are under cognitive strain. Furthermore, getting adults of any age to think about heart attacks appears to focus them on themes

relating to death and survival. Consequently, it would appear that, while Heart Attack Salience does not seem to lead to increases in death-thought suppression in the same way as Cancer Salience (as per Arndt et al., 2007), Heart Attack Salience does appear to entail the use death-related words and focus on death and survival themes in a comparable fashion to Mortality Salience, thereby making it a valid method of priming death-related cognitions that could be used in future TMT research.

While the above results demonstrate that heart attacks were consistently perceived as a death-relevant construct by participants in the first three studies, it is worth explicating the finding that the negativity and threat dimensions were perceived differently by participants in each of the respective studies. In particular, it is worth noting that older participants from the first study found the concept of death to be significantly less threatening (on the revised threat-negativity dimension) than either dental pain or heart attacks in contrast to participants aged 40-55 years from the second study who considered thinking about death and heart attacks to be significantly more threatening than thinking about dental pain (on the "degree of threat expressed" dimension). This finding is consistent with death anxiety literature that has demonstrated that older adults do not find death particularly threatening, while middle-aged adults up to about the age of 60 years exhibit anxiety about death-related ideas (e.g. Neimeyer & Van Brunt, 1995; Neimeyer et al., 2004; Russac et al., 2007; De Raedt & Van Der Speeten, 2008). Additionally, while they may not be anxious about death per se, the results of the first study on the combined threat-negativity dimension suggest that older adults may perceive dental pain and heart attacks as being highly negative and threatening. This may be because such health concerns represent more tangible negative threats to older adults which have the capacity to interfere with their current lifestyle; a finding that tallies with health psychology research suggesting that older adults have increasing concerns about their health status impeding their quality of life (e.g. Stoller & Pollow, 1994; Airey et al., 1999; Apostolidis et al., 2009). Similarly, the results of study three on the combined threat-negativity dimension suggest that younger adults may find heart attacks to be significantly more negatively threatening than dental pain as thinking about having a heart attack may undermine prevalent views that they may have about their own invulnerability (e.g. Jemmott et al., 1986; Avis et al., 1989; Wild et al., 2001; Taubman - Ben-Ari & Findler, 2005).

In contrast to these sets of results, it is interesting to note that middle-aged participants from study two expressed differences with respect to the threat and negativity dimensions. Firstly, the results of the "degree of threat expressed" dimension indicate that these middle-aged adults found death and heart attacks to be more threatening than dental pain; potentially as these middle-aged individuals were more concerned with death or serious disability heart attacks impeding their life goals (e.g. Becker, 1973; Erikson et al., 1986; Erikson & Erikson, 1997). However, individuals from this age cohort also found death, heart attacks and dental pain to be comparably negative (each $M > 2.5$). This may be because middle-aged adults consider death, heart attacks and dental pain to be negative in the sense that they may impede their "Generativity" in the short-term (Erikson et al., 1986; Erikson & Erikson, 1997), even if heart attacks and death are seen as more threatening as they constitute long-term threats to their life goals. In sum, there appear to be age-related differences in participants' responses towards the "degree of threat expressed" and "negativity expressed" dimensions of the content analyses of the first three studies which may reflect differences in health-related concerns across these different cohorts.

The differences between the respective cohorts on their results for the "deep vs. shallow writing" dimension are also worth considering. Indeed, when the results of participants' responses towards this item from each of the first three studies are considered together, they appear to suggest that thinking about heart attacks led to a greater symbolic orientation among younger adults than thinking about the control topic of dental pain and that thinking about death led to a greater symbolic orientation among older adults than thinking about either heart attacks or death but that middle-aged adults did not demonstrate any significant differences between groups on this dimension. The finding that older adults display more symbolic reactions towards death appears to be supported by existing research that older adults are more accustomed to thinking about death, less concerned with death impeding their life goals and tend to represent their lives in a more transcendent fashion (e.g. Erikson et al., 1986; Thorson & Powell, 1988; Tornstam, 1994; Erikson & Erikson, 1997; DePaola et al., 2003). This is presumably because these older adults have had a greater opportunity to think about the topic and may have read a greater amount of

literature on the subject of death (as evidenced by the fact that older adults were more likely to refer to philosophical or spiritual ideas in their encounters with Mortality Salience, as mentioned in Chapter 3, pages 1-94 - 1-95). Additionally, the lack of significant differences in depth of writing between thinking about heart attacks and thinking about dental pain among this group may be related to previous findings from health psychology and TMT research that older adults are more used to dealing with their declining health status (e.g. Taubman - Ben-Ari & Findler, 2005; Russac et al., 2007). In other words older adults may deal with specific health-related problems in a more concrete and practical manner; a suggestion that may warrant future investigation in health psychology research.

Similarly, middle-aged adults may exhibit more shallow characteristics of writing about heart attacks due to greater concerns that they may have about their own health and well-being as they are more used to thinking about such concerns (e.g. Taubman - Ben-Ari & Findler, 2005). In contrast, the finding that younger adults wrote about heart attacks in a symbolic fashion is a unique finding in the context of TMT. This pattern of results could be explained by the suggestion that, since younger adults generally consider themselves to be less vulnerable to health threats (e.g. Jemmott et al., 1986; Avis et al., 1989; Wild et al., 2001; Taubman - Ben-Ari & Findler, 2005), thinking about a health threat with potential fatal consequences such as heart attacks may be novel to them. A consequence of this novelty in thinking about heart attacks may be that they tend to focus more on the fatal aspects of heart attacks and they may think about heart attacks in a more abstract and symbolic level as they have not begun to consider such ideas in a more concrete fashion due to their age. Nonetheless, as evidenced by the low DTA levels exhibited by participants who received the Heart Attack Salience measure in the third study, these younger adults may have failed to find heart attacks to be existentially threatening, potentially because they held steadfast beliefs that heart attacks were not relevant to their health (e.g. following previous research by Jemmott et al., 1986; Avis et al., 1989; Davis et al., 1998; Wild et al., 2001; Taubman - Ben-Ari & Findler, 2005).

7.7 Word Frequency and Word Ambiguity Effects in the DTA literature

As highlighted in Chapter 5 (pages 1-143 - 1-149), the third study uncovered potential word frequency effects and word ambiguities in Greenberg et al.'s (1994) original

word fragment completion task for the measurement of DTA. This finding has potential implications for the measurement of DTA in TMT research. Indeed, TMT researchers who have used this method have consistently failed to report any steps that they have taken to control for such potential word frequency effects or word ambiguities. Additionally, despite this failure to control for word frequency and word ambiguity in Greenberg et al.'s (1994) initial version of the word fragment completion task, there is evidence of similar word frequency and word ambiguity effects within the broader context of TMT studies that have used subsequent word fragment completion tasks to measure DTA; including those who have employed either minor variations to the method such as including more or less potential death-related word fragments (e.g. Arndt et al., 1997b; Arndt et al., 2007) or more substantial variations to it like translating it into Hebrew (e.g. Mikulincer & Florian, 2000). This failure to control for word frequency and word ambiguity may mean that the DTA studies that have used such measures have overlooked the potential confounding effects of word frequency and word ambiguity on their results. The following examination of such word frequency and word ambiguity effects contains only published TMT studies that used an English language version of the word fragment completion task. DTA studies that used a translation of the word fragment completion task could be examined for word frequency effects in a similar fashion.

Common variations on the DTA word fragment completion task that can be examined for word frequency and word ambiguity effects include versions of the task that contain additional word fragments that were absent from Greenberg et al.'s (1994) original measure. Two common additional word fragments in this literature are STI_ _ used by Silvia (2001) and Dunkel (2009) and CO_ _SE used by Goldenberg et al. (1999), Silvia (2001), Burris & Rempel (2004) and Landau et al. (2004a). The former word fragment can be completed as either the death-neutral word "still" or the potentially death-related word "stiff" and the latter can be completed as either the death-neutral word "course" or the death-related word "corpse". However, as illustrated in Table 7.1, the words "still" and "course" have considerably higher frequencies per million than their respective death-related counterparts "stiff" and "corpse"; indicating a potential for the confounding influence of word frequency effects. Additionally, the more common adjective-form of the word "stiff" does not have a death-related meaning. Consequently, it is difficult to tell if participants who

responded with the word "stiff" in the DTA studies documented by Silvia (2001) and Dunkel (2009) intended the word to represent the death-related vernacular noun or the more common non-death-related adjective-form as these participants were not given the option to clarify which meaning they had intended.

Word Fragment	**Death Completion**	**Frequency**	**Death-Neutral Completion**	**Frequency**
STI_ _	*Stiff*	1, 310	*Still*	72, 774
CO_ _SE	*Corpse*	1, 153	*Course*	57, 776

Table 7.1: Word Frequencies per One Hundred Million Words Derived from Kilgarriff (1996) for the Death Completions and Most Common Death-Neutral Completions of Some Common Additional Word Fragments from the DTA literature

Another common variation on the DTA word fragment completion task involves minor alterations to pre-existing word fragments. For instance, both Silvia (2001) and Burris & Rempel (2004) modified the word fragment "DE_ _" to "D_ _D", which can be completed as either the death-neutral word "deed" or the death-related words "died" or "dead". Additionally, the word fragment "GRA_ _" has been altered by Burris & Rempel (2004) and Norenzayan, Dar-Nimrod, Hansen & Proulx (2009) to become "_RAVE", which can be completed as either the death-neutral word "brave" or the death-related word "grave". In the case of the former word fragment, the death-related word "dead" and the death-related headword "die" have much higher frequencies than the death-neutral word "deed" (see Table 7.2 below). This suggests that there may have been a potential confounding influence of word frequency effects in the completion of the word fragment "D_ _D" in these studies, where participants may have favoured the death-related completions. In contrast, the death-related word "grave" appears to have a very similar frequency of occurrence to the death-neutral word "brave" (Table 7.2), suggesting that it is probably unlikely that word frequency had a confounding influence on participants' responses to the word fragment ""_RAVE" in those studies that used this word fragment. Nevertheless, as indicated previously in Chapter 5 (page 1-145), it is unclear whether participants who respond with the completion "grave" to this word fragment intend this response to represent the death-related noun or the death-neutral adjective. Consequently, while this word fragment initially appears to have improved upon its alternative "GRA_ _" by

shortening the gap between the word frequencies pertaining to its death-related and death-neutral completions, the ambiguity concerning whether or not the completion "grave" constitutes a death-related word suggests that this death-related word is still a problematic item for the measurement of DTA.

Word Fragment	**Death Completion**	**Frequency**	**Death-Neutral Completion**	**Frequency**
D_ _D	*Dead*	11,341	*Deed*	1, 282
	Died (Die)*	22,087		
_RAVE	*Grave*	1, 740	*Brave*	1, 760

*The frequency of the word lemma in parenthesis is reported for this word fragment completion.

Table 7.2: Word Frequencies per One Hundred Million Words Derived from Kilgarriff (1996) for the Death Completions and Most Common Death-Neutral Completions of Some Commonly Modified Word Fragments from the DTA literature

A good example of a DTA study with the word fragment completion task that has employed both additional word fragments and variations on pre-existing DTA word fragments is Burris & Rempel's (2004) study, where the authors presented participants with 13 different word fragments that could be completed in either death-neutral or death-related ways. Table 7.3 presents these 13 word fragments and their potential death-related and death-neutral completions. It is clear from this table that there is once again great variation between many of the death-related and death-neutral completions to the word fragments used in this study. Indeed, it is particularly notable that many of the death-related or death-neutral completions were absent from Kilgarriff's (1996) word frequency database (i.e. the completions which have a corresponding frequency of 0 beside them on the table), while their alternative death-related or death-neutral counterparts had a frequency listing in the same database. In addition to this evidence of a confounding influence of word frequency effects in the completion of the word fragments, many of the novel word fragments have purportedly death-related completions that are arguably not specifically death-related. For instance, in conjunction with the potentially death-ambiguous word fragment completions "buried", "grave" and "stiff" that have been mentioned previously, the alleged death-related completions "ashes", "bones" and "rotting" may each be

interpreted in non-death-related ways depending on their use in a particular context. Specifically, "ashes" may refer to "the ashes of a fire", "bones" may refer to "the bones of the matter" or "rotting" may refer to "rotting food"; each of which do not appear to have anything to do with the concepts of human death or mortality. Since it cannot be ruled out whether or not participants who responded with one of these latter interpretations intended them to represent a death-related or death-neutral word, they can each be seen as problematic items for the measurement of DTA.

Word Fragment	**Death Completion**	**Frequency**	**Death-Neutral Completion**	**Frequency**
_ _FFIN	*Coffin*	1, 241	*Muffin*	0
ST_FF	*Stiff*	1, 310	*Stuff*	6, 627
BON_ _	*Bones (Bone*)*	4, 665	*Bonds (Bond*)*	3, 753
BU_Y	*Bury*	2, 987	*Busy*	5, 221
D_ _D	*Dead*	11,341	*Deed*	1, 282
	Died (Die)*	22,087		
_RAVE	*Grave*	1, 740	*Brave*	1, 760
S_ULL	*Skull*	1, 234	*Scull*	0
RO_ _ING	*Rotting (Rot*)*	0	*Rolling (Roll*)*	5, 202
_E_EASED	*Deceased (Decease*)*	0	*Released (Release*)*	7, 822
CO_ _SE	*Corpse*	1, 153	*Course*	57, 776
_OMB	*Tomb*	0	*Bomb*	3, 703
AS_ES	*Ashes (Ash*)*	1,051	*Asses (Ass*)*	0

*The frequencies of the word lemmas in parenthesis are reported for these word fragment completions.

Table 7.3: Word Frequencies per One Hundred Million Words Derived from Kilgarriff (1996) for the Death Completions and Most Common Death-Neutral Completions of Word Fragments in Burris & Rempel (2004)

7.7a Recommendations for Future DTA Research

The potential confounding factors of word frequency and the use of supposedly death-related word fragment completions that are arguably not specific to mortality or death-related concerns outlined in Chapter 5 and in the above examination serves to demonstrate that more experimental rigour is necessary in the measurement of DTA

within the TMT literature. Future DTA research using the word fragment completion method should eliminate the potential confounding variable of word frequency by redesigning the method to control for word frequency. The word fragments should be designed in such a way that they can be completed with either a death-neutral or death-related word that are of comparable frequency, as per word fragments such as "DE_ _". Additionally, DTA researchers should ensure that the word fragment completions that are supposed to be of a death-related nature cannot be interpreted in non-death-related words, as one could with the words *stiff*, *grave*, *bury*, *ashes*, *bones* and *rotting* listed above. Indeed, since these sorts of words could be considered ambiguous with regard to their relatedness to the concepts of death and mortality, they should be avoided and henceforth removed from the design of future versions of the word fragment completion task for the measurement of DTA.

There have also been a couple of other notable methodologies from the TMT literature that have been developed for measuring DTA that may be used in the event that the above guidelines regarding the word fragment completion task are too constraining. The most common alternative to the word fragment completion methodology is the lexical decision task method that has been used in several DTA studies (e.g. Bassett, 2005; Koole & Van den Berg, 2005; Schimel et al., 2007; Hayes et al., 2008). In particular, a recent version of this methodology developed by Schimel et al (2007) may specifically eliminate the potential biases of word frequency effects. As with other lexical decision tasks, participants in this study were asked to determine whether a string of letters was a word or not and the authors argued that people should react faster and more accurately towards death-related words compared to other words when death thoughts were highly accessible to them. In order to test this prediction, the authors randomly presented their participants with 40 non-words, 18 neutral words, 6 negative words and 6 death-related words for lexical decision. Importantly, following the recommendations of Bargh and Chartrand (2000), they chose negative and neutral words that would be roughly comparable to the death words on word frequency and word length in order to control for the possibility that word frequency effects might have interfered with the priming effects with which they were primarily interested in their study. Consequently, the authors selected death-related, negative and neutral words for use in their lexical decision task that were matched on a word-to-word basis by their frequency of occurrence (per million

words). This led the authors to be fairly confident that they had eliminated the influence of word frequency effects on their participants' subsequent lexical decisions. However, it should be noted that these researchers still used the words "buried" and "grave" in their lexical decision task, which are potentially ambiguous with regard to their relatedness to the concepts of death and mortality. As a result, future versions of this lexical decision task should replace these words with alternatives such as "corpse", "deceased" or "murder" which are more specifically death-related.

The other notable methodology for the measurement of DTA developed by Gailliot et al. (2006) avoids the issue of word frequency entirely. Specifically, the authors developed a method where images that were presented to participants could be perceived as being death-neutral or death-related. For instance, one of their images could be perceived as either a lady sitting in front of a large mirror or as a skull. These researchers argued that a participant's level of DTA could be inferred on the basis of their perception of such images (i.e. if participants perceived such images in the death-related mode, it was taken as an indication of a high level of DTA). Since this methodology uses images rather than words as its dependent variable, word frequency and word ambiguity effects are avoided.

Another common measure that has the potential to be adapted for use as a measure of DTA is the masked-word identification or anagram task. This task involves the re-arrangement of nonsensical anagrams into words by participants and the possible solutions typically involve both a target word relating to a recently primed or activated concept and a control word that bears no relation to the recently primed or activated concept. For instance, a study which initially asks participants to think about talk show hosts might increase such participants' likelihood of solving the anagram "HAPOR" with the solution "Oprah" rather than "Harpo" (Sia et al., 1999). Many studies using this method have found that recently primed or activated concepts are more likely to be recognised within such nonsensical anagrams (e.g. Roediger, 1990; Sia et al, 1999). Consequently, this measure could be adapted for the study of DTA by creating anagrams for death-related words that have a corresponding death-neutral counterpart. For instance, following Mortality Salience or a similar measure, participants could be presented with nonsensical anagrams such as "SLIKL", which

could be solved with the death-neutral word "skill" or the death-relevant word "kills". As per the above recommendations, however, such anagrams should control for word frequency effects and should use target words that are specifically death-relevant. In this regard, while there is a substantial difference in word frequency between the word "skill" and the word lemma "kill" according to Kilgarriff's (1996) word frequency database (11, 423 and 15, 620 occurrences per one hundred million words respectively), the specific word-form "kills" is less common and may therefore arguably constitute an appropriate death-related target word for the nonsensical anagram "SLIKL".

To conclude this examination of current forms of measuring the DTA construct, researchers who seek to operationalise this construct should choose a measure which controls for the effects of word frequency and should avoid using dependent variables that are not specifically death-related. Additionally, if the word fragment completion method is to be used as a measure of DTA in the future, it should be redesigned to eliminate such potential confounding factors. Alternatively, future DTA research could adapt a pre-established method for the measurement of DTA such as the anagram task used in other studies involving construct accessibility or utilise already established alternative methodologies for the measurement of DTA such as the counterbalanced lexical decision task method employed by Schimel et al. (2007) or the ambiguous image method developed by Gailliot et al. (2006).

7.8 Strengths and Limitations of the Current Research Programme

A major strength of the current research programme is that it did not rely on student populations to examine its principal research questions. TMT research has typically involved the use of psychology student samples who often participate in order to earn course credit. However, there are several problems that have been noted regarding the use of student participants in this fashion. For instance, Foot & Sanford (2004) have noted that, in addition to the fact that student samples are inherently biased in age, experience, intellectual ability, ethnicity and social class, the practice of providing course credit in exchange for research participation perhaps unfairly coerces these students to serve as participants. In contrast, the three central studies in the current research programme (Studies 1, 2 & 4) targeted middle-aged and older adults who volunteered to participate; thereby providing a more ecologically valid cohort of

participants who were potentially at risk for developing CVD and avoiding the potential pitfalls of course credit coercion. Additionally, while the third study in the current programme incorporated student participants, these students participated on a voluntary basis rather than participating in exchange for course credit.

Another major strength of the current research programme was the inclusion of the novel Heart Attack Salience task as a method of priming death-related thoughts among participants. Following on from Arndt et al.'s (2007) Cancer Salience task, the Heart Attack Salience task was developed specifically for this study in order to allow participants to explicitly think about having a heart attack and what happens to their bodies when they have a heart attack. Across the first three studies in the research programme, three separate content analyses on different cohorts of participants established the potential validity of this task for priming death-related thoughts in participants through the findings that it was significantly more likely to elicit thoughts of death and survival than a control task. Furthermore, the content analyses of the first two studies demonstrated that thinking about heart attacks was just as likely to elicit thoughts concerning death as thinking about the subject of death itself (i.e. Mortality Salience). Thinking about having a heart attack may also be a more naturalistic way of eliciting death-related thoughts among participants for future TMT research compared to thinking about the abstract concept of death. This is because thinking about heart attacks may represent a more tangible everyday concern for people, in contrast to thinking about the abstract topic of death; the latter of which is normally confined to academic or artistic investigations. Following such ideas, the Heart Attack Salience task appears to be a valid and naturalistic form of priming death-related cognitions in participants.

One limitation of the studies in the current research programme is that the studies involving participants' reactions towards the CVD Risk Biochip (i.e. Studies 1, 2 & 4) did not incorporate a measure of participants' actual use of the CVD Risk Biochip. On this subject, one could question the ecological validity of these studies since they involved participants' reactions towards a description of the device rather than a physical presentation of the device. In other words, a physical presentation of the device might have helped to establish more closely whether or not mortality reminders would have had any bearing on participants' real life encounters with the

device. However, in the current context, physical presentation of a prototype version of the CVD Risk Biochip was not possible. Despite this potential limitation, there are a number of reasons to suggest that the absence of a research study involving the actual presentation of a device like the CVD Risk Biochip to participants may not have been a major hindrance to the validity of the results of the relevant studies in the current programme. Firstly, each of the participants in these studies had been assured that the CVD Risk Biochip was a genuine device that was being developed by the BDI. Additionally, the De Facto Intentions measure in each study had been explicitly designed to approximate participants' potential real life encounters with the device. This could be seen to represent an ecologically valid measure in its potential removal of hypothetical bias and implicit confirmation of the existence of the device. Moreover, participants' responses towards this more ecologically valid measure did not appear to depart substantially from participants' responses towards the attitudes and behavioural intentions measures in these studies (apart from a slight gender bias between middle-aged males' and females' commitment to using this device, as discussed previously), suggesting that there may not be a major gap between attitudes, behavioural intentions and behavioural commitment to use health threat detection devices like the CVD Risk Biochip following mortality reminders.

It should also be noted that some prior TMT research concerning the effects of mortality reminders on participants' engagement with health threat detection behaviours had included ecologically valid measures and subsequently reported findings that were analogous to their own measurements of attitudes and behavioural intentions towards the same detection behaviours. For instance, Goldenberg et al. (2008) found that presenting younger women with mortality reminders led to a reduction in their intentions to perform breast self-exams (Study 1) and led them to conduct shorter exams on a plastic breast model (Study 2). Interestingly, these authors also found that presenting older women at risk for developing breast cancer with similar mortality reminders resulted in them performing shorter breast self-exams on themselves (Study 3). Likewise, Goldenberg et al. (2009) demonstrated that mortality reminders led highly neurotic younger women to be less willing to imagine undergoing a mammogram (Study 1) and subsequently found that highly neurotic older women who were given mortality reminders just before they received a mammogram perceived a greater amount of discomfort with the procedure (Study 2).

These studies suggest that the more hypothetical scenario of examining younger adults' intentions to perform health threat detection behaviours following mortality reminders led to an equivalent outcome with respect to the ecologically valid scenario of examining older at-risk adults' actual performance of such behaviours following mortality reminders. Following these prior findings, it appears likely that participants' reactions towards a description of the CVD Risk Biochip that had been uncovered in the current research programme should be akin to participants' reactions towards a physical presentation of the device itself.

Another potential limitation of the research programme relates to the use of the Heart Attack Salience task in the first two studies of the current programme. Specifically, these studies presented participants with a Heart Attack Salience task or corresponding salience measure and a distraction and examined these participants' subsequent reactions to the CVD Risk Biochip but did not present them with one of these measures in combination with a Cognitive Load task. In this regard, since Arndt et al. (2007) had found that presentation of a Cancer Salience task under conditions of high cognitive load led female participants to express lower intentions to perform breast self-exam behaviours and male participants to express lower intentions to perform testicular self-exam behaviours compared to those who were presented with a Control task under similar conditions of high cognitive load, one could argue that presenting participants with a Heart Attack Salience task under conditions of high cognitive load may have led to more defensively avoidant responses towards the CVD Risk Biochip in these studies.

Nonetheless, there are a couple of reasons why such a finding may have been unlikely. Firstly, as previously noted, the content analyses of participants' responses towards the salience measures in these studies revealed that Heart Attack Salience was just as likely to lead to a high number of thoughts concerning death among participants as Mortality Salience and that participants' responses towards this task contained an equal focus on death and survival themes compared to Mortality Salience. This finding contrasts with Arndt et al.'s (2007) findings that Cancer Salience led to a greater focus on death and survival themes and a greater number of death-related words in participants' open-ended responses to the measure when compared to participants' responses towards the Mortality Salience measure. In other

words, thinking about developing cancer appears to be more threatening than thinking about one's death but thinking about having a heart attack may be just as threatening as thinking about one's death. Therefore, by the logic of TMT authors, Heart Attack Salience and a distraction should lead to roughly analogous responses among participants to receiving Mortality Salience and a distraction or Cancer Salience and a Cognitive Load task (i.e. since each of these sets of conditions should lead a participant to experience a distal mode of processing mortality reminders according to TMT; e.g. Pyszczynski et al., 1999; Pyszczynski et al., 2000; Arndt et al., 2007; Goldenberg & Arndt, 2008). Secondly, the results of Study 3 of the current research programme demonstrated that there was no difference in DTA between participants who received a Heart Attack Salience and distraction task and participants who received a Heart Attack Salience task under conditions of cognitive load. This would appear to suggest that receipt of a Heart Attack Salience task and subsequent distraction should be comparable to receiving a Heart Attack Salience task under conditions of cognitive load. Consequently, it is unlikely that participants who received a Heart Attack Salience task under conditions of cognitive load would have exhibited more defensively avoidant responses towards the CVD Risk Biochip than those participants in the first two studies who received a Heart Attack Salience task and subsequent distraction.

It could also be argued that the placement of a "darkly phrased" distraction task, the CVD Risk Biochip information sheet and the emotively-phrased attitude and behavioural intentions items may have had an impact on the likelihood of whether or not participants signed up for the pilot study in the first two studies. In other words, the fact that participants in these studies were presented with each of these sections in the questionnaire before they encountered the De Facto Intentions measure may have led them to be less likely to sign up for the pilot study as these sections could have conceivably elicited negative emotions such as fear and anxiety among participants. Nonetheless, such an effect is unlikely for a number of reasons. Firstly, most participants who read the distraction task in these studies reported that they found the passage to be "boring" and many participants spontaneously commented that the task was very suitable as a distraction during the debriefing session after they had completed the questionnaire. Consequently, it is unlikely that such a passage would have elicited fear and anxiety among such participants. Likewise, as indicated earlier

in the Discussion Section of Chapter 3 (see pages 1-87 - 1-89), it is unlikely that subtle mortality reminders in the CVD Risk Biochip Information sheet would have elicited fear and anxiety among participants who read it as prior health psychology research has found that such general mortality reminders tend to be psychologically minimised by people (e.g. Croyle & Sande, 1988; Van Steenkiste et al., 2004; Peretti-Watel et al., 2007) and prior TMT cancer-screening research involving similar general mortality reminders (Arndt et al., 2007; Goldenberg et al., 2008; Goldenberg et al., 2009) also found that participants only reacted towards these mortality reminders after having been specifically primed with a personal mortality reminder. Furthermore, as previously noted, most of the participants in these studies signed up for the pilot study and many spontaneously discussed how they felt that the device was of great benefit after they had completed the questionnaire, suggesting that it is unlikely that fear and anxiety resulting from encountering these sections of the questionnaire had a negative impact on their desire to participate in the proposed pilot study. Finally, it should also be noted that the high behavioural commitment to use the device that was found in the first two studies was replicated in the Study 4 in the current programme, where a neutral word search distraction task was used and the emotionally neutral CVD Risk Biochip Body-Relatedness Scale was presented to participants after they received the distraction task, information sheet, attitude and behavioural intentions scales but before they completed the De Facto Intentions measure. In light of the above, it is unlikely that emotional reactions of fear or anxiety arising from encounters with these sections of the questionnaire affected the likelihood of whether or not participants in the first two studies signed up for the proposed pilot study.

7.9 Conclusions

The current research programme had been established in order to investigate whether or not existential anxiety could act as a barrier to the voluntary uptake of the CVD Risk Biochip by individuals (e.g. in a GP's office or in a home setting). In exploring such an area of investigation, the programme was the first of its kind to apply TMT mechanisms to the psychosocial study of POCT devices and was the first study to examine the relationship between existential anxiety and CVD through a TMT framework. The first three studies in the programme also pioneered the use of a Heart Attack Salience task as a way of effectively priming death-related thoughts and the

third study uniquely examined the cognitive dynamics underpinning the use of this task. The results of the content analyses of the salience measures in these studies also support the proposition that this novel Heart Attack Salience task has the capacity to prime thoughts about death among participants to the same extent as Mortality Salience; indicating that this task is a valid independent measure for the future study of TMT.

The main results of the research programme also uniquely demonstrated that POCT devices like the CVD Risk Biochip may have a beneficial effect on the potential uptake of screening behaviours generally. On the former point, the overwhelmingly positive evaluations of the CVD Risk Biochip and high behavioural intentions and commitment to use the device displayed by middle-aged and older adults' responses in Studies 1, 2 and 4 suggests that such POCT devices may have a high uptake, in contrast to other forms of health threat detection that have been reported in the health psychology literature to have a low uptake among similar cohorts of adults. This potential high uptake may be due to the fact that such POCT devices furnish individuals with a risk status for developing a condition rather than indicating the presence or absence of a condition and have the capacity to provide a sense of autonomy to such individuals. In this respect, it may be particularly important to emphasize that such devices have the potential to be used by lay people to monitor their health status and to explicitly frame such POCT devices as providing an indication of "risk" for developing a condition.

The results of the research programme were also exceptional in demonstrating that TMT may not work in an Irish context; an idea that is supported by prior TMT studies involving Irish participants and can be interpreted in the light of qualitative research that has found that Irish people hold cultural representations of death that may protect them from existential anxiety. A central implication of this finding is that that TMT processes may not be cross-culturally reliable. Moreover, a clearer picture of the meaning and value-oriented contents of cultural worldviews may need to be established through qualitative research or with reference to established anthropological evidence before carrying out TMT research in the future in order to ensure the validity of TMT defences to a particular cultural group.

Some additional findings that were uncovered in the current programme also provide moderate support prior health psychology literature concerning gender differences with respect to health threat detection behaviours and age-related differences with respect to death-related perceptions. Older adults considered heart attacks and dental pain to be more negative and threatening than death and represented death in a more symbolic fashion; a set of findings which potentially reflects a moderating existential concern among these adults and growing concern with their health status. In contrast, middle-aged adults considered thinking about death and heart attacks to be significantly more threatening than thinking about dental pain, potentially because both may serve to impede their life goals. Younger adults also found heart attacks to be particularly threatening but represented them in a more symbolic fashion than older adults or middle aged adults, potentially due to the novelty of reflecting about such a topic. There was also evidence that middle-aged males displayed more negative behavioural commitment towards the CVD Risk Biochip compared to middle-aged females in the current research programme, suggesting that gender-related concerns may need to be factored into future TMT research concerning health behaviours.

Finally, the results of Study 3 in the current programme uncovered some limitations to the current methods of measuring DTA in the TMT literature. Specifically, the potential confounding effects of word frequency and the ambiguity of certain death-related words in the standard DTA measures were highlighted. In order to control for such effects, word fragment completion, lexical decision task and anagram task methodologies that remove the confounding effects of word frequency and word ambiguity should be employed in the future measurement of DTA.

In conclusion, the current research programme was the first to study the psychosocial aspects of the use of POCT devices through a TMT framework and involved a primary examination of CVD in the context of TMT. The central results of the study demonstrate that POCT devices like the CVD Risk Biochip may have a beneficial effect on the potential uptake of screening behaviours generally and highlight the potential for cross-cultural variability in responses towards TMT methodologies. The findings of the programme also suggest some unique recommendations for the future study of TMT, including the performance of initial qualitative investigations of the

cultural worldviews of a particular cohort before examining TMT processes and the necessity of controlling for the confounding effects of word frequency and word ambiguity in future DTA research.

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APPENDIX A: COMMON CARDIAC MARKERS USED IN POCT

Myoglobin

Myoglobin is the earliest-appearing marker to indicate myocardial injury, appearing at a highly clinically significant level within 2 hours of presentation and remaining in the blood at high levels up to 6 hours after presentation (McCord et al., 2001). However, its clinical specificity is questionable as it has been frequently found to appear in clinically high levels in patients with skeletal muscle injury (e.g. Christenson & Collinson, 2004; Hudson et al., 1999; Yang & Zhou, 2006) and patients with renal insufficiency also have been found to present with elevated myoglobin levels (Azzazy & Christenson, 2002).

Creatine Kinase-MB

Creatine-Kinase-MB (CKMB) is another protein released in response to muscle damage. It is more specific than myoglobin (Christenson & Collinson, 2004) but does not present at such an early stage. Serial sampling of this cardiac marker at 8-12 hours yields high sensitivity to myocardial injury (Hudson et al., 1999). Unfortunately, like myoglobin, CK-MB also appears in large amounts in skeletal muscle injury (e.g. Christenson & Collinson, 2004; Hudson et al., 1999; Yang & Zhou, 2006). Nonetheless, CK-MB can be uniquely used to detect the quantity of infarcted tissue and re-infarction in a patient if used in conjunction with other cardiac markers (Yang & Zhou, 2006).

The Troponins

Cardiac Troponin T (cTnT) and Cardiac Troponin I (cTnI) are regulatory proteins of the thin filament of striated muscle (Wu et al., 1998). They are considered to be the gold standard cardiac markers for measuring myocardial injury (McDonnell et al., 2009) and have emerged as the preferred cardiac biomarkers for risk stratification due to their high specificity and length of elevation for many days after myocardial injury (e.g. Wu et al., 1998; Hudson et al., 1999; Christenson & Collinson, 2004; Yang & Zhou, 2006; Christenson & Azzazy, 2009). CTnT has been demonstrated to have high prognostic power, especially in the prediction of CVD risk in patients with symptoms of chest pain (Ordóñez-Llanos et al., 2006). However, there has been recent evidence of some discrepancy between cTnT and cTnI measurement results, with cTnI being

found to be more accurate at assessing cardiac risk (Cramer et al., 2007). Issues with Troponin surrounding false positive results, questions over its use for detection of reinfarction and its inability to detect infarct size have led to the continued usage of CK-MB and myoglobin measurement (Christenson & Azzazy, 2009).

B-type natriuretic peptide

B-type natriuretic peptide (BNP) is a neurohormone secreted from the cardiac ventricles as a reaction to increasing volume and pressure (Harrison et al., 2002). Measurement of BNP in the first few days after presentation of symptoms of ischemia can indicate the severity of ischemic damage (McDonnell et al., 2009), the degree of underlying impairment in left ventricular function (Maisel et al., 2002) and can provide risk stratification information for multiple acute coronary syndromes (De Lemos et al., 2001). It is used frequently as a "rule-out" test for heart failure (Tang et al., 2007; Peacock, 2002) and predicts mortality in patients with chronic heart failure (Cowie et al., 2003). It is particularly useful in clinical judgements in relation to the presentation of acute dyspnea in the emergency department (e.g. McCullough et al., 2002; Harrison et al., 2002; Harrison, 2005). Specifically, a high level of BNP in presentation with dyspnea predicts potential risk for CHF (Harrison et al., 2002). In general, it has been found that the greater the BNP concentration in the blood, the greater the cardiac damage (Cowie et al., 2003).

C-Reactive Protein

C-Reactive Protein (CRP) is a non-specific inflammatory marker that has been shown to serve as a powerful predictor of future myocardial infarction (Yang & Zhou, 2006). CRP is a protein that is produced in response to inflammatory tissue damage in order to stimulate tissue factor production (de Ferranti & Rifai, 2002). Because of this, CRP measurement has also been found to be useful in predicting both short and long-term CVD risk and in assessing interventions for CVD, as it only exists in elevated levels in the presence of inflamed tissue damage (de Ferranti & Rifai, 2002). However, high CRP concentrations have been linked to many other common and uncommon inflammatory conditions other than CVD, including pulmonary inflammation, cancer, gastro-dudenal inflammation, urinary inflammation and musculoskeletal inflammation (Dhingra et al., 2007). In addition, the use of CRP in risk stratification for CVD may be confounded in obese individuals, blacks and individuals with

chronic pulmonary levels, as these groups of people tend to exhibit elevated levels of CRP (Kraus et al., 2007). As a result, CRP should be used in conjunction with other markers (e.g. the troponins) in CVD risk assessment.

APPENDIX B: PLAIN LANGUAGE STATEMENTS AND CONSENT FORMS

B1: Study 1 Plain Language Statement and Consent Form

You are being asked to participate in a research study relating to aspects of health and better ways of knowing about your health. Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by a Science Foundation Ireland grant.

You are eligible to take part if you are over 55 years of age and have not had a major heart related event (e.g. a heart attack). If you agree to take part in this study, you will be asked to complete a questionnaire. This questionnaire contains four sections of questions, which will ask you to give your opinions on various topics. Some of the questions may make you feel a little uncomfortable. However, your participation in this study is entirely voluntary. If any aspect of the study makes you feel unduly uncomfortable or distressed at any stage, you may withdraw from the study without prejudice. Additionally, you may withdraw to participate at any time and without giving any reasons for your withdrawal. Withdrawal will not result in penalization of any kind. If you wish to discuss any unpleasant or distressful thoughts or emotions that you experienced when completing the questionnaire, please feel free to do so with Mr. Simon Dunne after you have completed the questionnaire.

The research will form the basis of reports, academic publications, conference papers and other scientific publications. The information that will be obtained from the study should greatly benefit the community by informing medical practitioners about attitudes towards health and healthcare methods.

If you agree to take part in this study, all information collected will be kept strictly confidential. The form that you sign to give your consent to participate in the study will be kept in a secure location that is separate from where the completed questionnaire will be stored. All of the completed questionnaires will be kept for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne.

Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne from the Dublin City University School of Nursing on 01 7007796.

The Dublin City University Research Ethics Committee has approved this research project. If participants have concerns about this study and wish to contact an independent person, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

Research Study Title: *Psychosocial Aspects of Biomedical Diagnostics*
Principal Investigator: *Simon Dunne*
Other Investigators: *Dr. Pamela Gallagher; Dr. Anne Matthews*
Faculty: *DCU School of Nursing*

Please Circle "Yes" or "No" for the following questions, where appropriate.

I confirm that I have read the Plain Language Statement for the above project and that I understand the information provided therein.

Yes / No

I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

Yes / No

I confirm that I have never experienced a major heart-related event (e.g. a heart attack)?

Yes / No

I understand that this consent form will be kept in a location separate from the completed questionnaire and the questionnaire will only collect information that does not identify me by name.

Yes / No

I understand that the anonymous data collected in this study will be used to form the basis of reports, academic publications, conference papers and other scientific publications.

Yes / No

I understand that my participation in this study is voluntary and that I am free to withdraw at any time, without giving any reason and without any penalisation for doing so.

Yes / No

I have read and understood the information in this form. The researchers have answered my questions and concerns, and I have a copy of this consent form. Therefore, I consent to take part in this research project.

Participants Signature: _____

Name in Block Capitals: _____

Witness: _____

Date: _____

B2: Study 2 Plain Language Statement and Consent Form

You are being asked to participate in a research study relating to aspects of health and better ways of knowing about your health. Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by a Science Foundation Ireland grant and an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholarship.

You are eligible to take part if you are between 40 and 55 years of age and have not had a major heart related event (e.g. a heart attack). If you agree to take part in this study, you will be asked to complete a questionnaire. This questionnaire contains four sections of questions, which will ask you to give your opinions on various topics. Some of the questions may make you feel a little uncomfortable. However, your participation in this study is entirely voluntary. If any aspect of the study makes you feel unduly uncomfortable or distressed at any stage, you may withdraw from the study without prejudice. Additionally, you may withdraw to participate at any time and without giving any reasons for your withdrawal. Withdrawal will not result in penalization of any kind. If you wish to discuss any unpleasant or distressful thoughts or emotions that you experienced when completing the questionnaire, please feel free to do so with Mr. Simon Dunne after you have completed the questionnaire.

The research will form the basis of reports, academic publications, conference papers and other scientific publications. The information that will be obtained from the study should greatly benefit the community by informing medical practitioners about attitudes towards health and healthcare methods.

If you agree to take part in this study, all information collected will be kept strictly confidential. The form that you sign to give your consent to participate in the study will be kept in a secure location that is separate from where the completed questionnaire will be stored. All of the completed questionnaires will be kept for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne.

Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne from the Dublin City University School of Nursing on 01 7007796.

The Dublin City University Research Ethics Committee has approved this research project. If participants have concerns about this study and wish to contact an independent person, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

Principal Investigator: *Simon Dunne*
Other Investigators: *Dr. Pamela Gallagher; Dr. Anne Matthews*
Faculty: *DCU School of Nursing*

Please Circle "Yes" or "No" for the following questions, where appropriate.

I confirm that I am between 40-55 years of age.

Yes / No

I confirm that I have read the Plain Language Statement for the above project and that I understand the information provided therein.

Yes / No

I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

Yes / No

I confirm that I have never experienced a major heart-related event (e.g. a heart attack)?

Yes / No

I understand that this consent form will be kept in a location separate from the completed questionnaire and the questionnaire will only collect information that does not identify me by name.

Yes / No

I understand that the anonymous data collected in this study will be used to form the basis of reports, academic publications, conference papers and other scientific publications.

Yes / No

I understand that my participation in this study is voluntary and that I am free to withdraw at any time, without giving any reason and without any penalisation for doing so.

Yes / No

I have read and understood the information in this form. The researchers have answered my questions and concerns, and I have a copy of this consent form. Therefore, I consent to take part in this research project.

Participants Signature: _____

Name in Block Capitals: _____

Witness: _____

Date: _____

B3: Study 3 Plain Language Statement

You are being asked to participate in a research study, which has been designed to investigate the relationship between personality characteristics and how well people can perform two tasks at the same time. Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by an Irish Research Council for the Humanities and Social Sciences Postgraduate Scholarship and a Science Foundation Ireland grant.

You are eligible to take part if you are over 18 years of age and have not had a major heart related event (e.g. a heart attack). By agreeing to participate in this study, you are confirming that you are at least 18 years of age and have not had a major heart-related event. If you agree to take part in this study, you will be asked to complete the attached questionnaire. This questionnaire contains several sections of questions, which will ask you to give your opinions on various topics or to perform one or two simple tasks. Some of the questions may make you feel a little uncomfortable. However, your participation in this study is entirely voluntary. If any aspect of the study makes you feel unduly uncomfortable or distressed at any stage, you may withdraw from the study without prejudice. Additionally, you may withdraw at any time and without giving any reasons for your withdrawal. Withdrawal will not result in penalization of any kind. If you wish to discuss any unpleasant or distressful thoughts or emotions that you experienced when completing the questionnaire, please feel free to do so with Mr. Simon Dunne after you have completed the questionnaire.

The research will form the basis of reports, academic publications, conference papers and other scientific publications. The information that will be obtained from the study should greatly benefit the community by informing clinicians about attitudes towards health and healthcare methods.

If you agree to take part in this study, all information collected will be kept strictly confidential. All of the completed questionnaires will be kept in a

secure location for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne. Involvement/non-involvement in this study will not affect your ongoing assessment/grades or your relationship with DCU in any way.

Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne from the Dublin City University School of Nursing on 01 7007796.

The Dublin City University Research Ethics Committee has approved this research project. If participants have concerns about this study and wish to contact an independent person, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

B4: Study 4 Plain Language Statement and Consent Form

You are being asked to participate in a research study, which investigates personal reactions towards various topics such as personal life experiences, aspects of health and better ways of knowing about your health. Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by a Science Foundation Ireland grant and an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholarship.

You are eligible to take part if you are between 40 and 55 years of age. If you agree to take part in this study, you will be asked to complete a questionnaire. This questionnaire contains five sections of questions, which will ask you to give your opinions on various topics. Some of the questions may make you feel a little uncomfortable. However, your participation in this study is entirely voluntary. If any aspect of the study makes you feel unduly uncomfortable or distressed at any stage, you may withdraw from the study without prejudice. Additionally, you may withdraw to participate at any time and without giving any reasons for your withdrawal. Withdrawal will not result in penalization of any kind. If you wish to discuss any unpleasant or distressful thoughts or emotions that you experienced when completing the questionnaire, please feel free to do so with Mr. Simon Dunne after you have completed the questionnaire.

The research will form the basis of reports, academic publications, conference papers and other scientific publications. The information that will be obtained from the study should greatly benefit the community by informing medical practitioners about attitudes towards health and healthcare methods.

If you agree to take part in this study, all information collected will be kept strictly confidential. The form that you sign to give your consent to participate in the study will be kept in a secure location that is separate from where the completed questionnaire will be stored. All of the completed questionnaires

will be kept for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne.

Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne from the Dublin City University School of Nursing on 01 7007796.

The Dublin City University Research Ethics Committee has approved this research project. If participants have concerns about this study and wish to contact an independent person, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

Principal Investigator: *Simon Dunne*
Other Investigators: *Dr. Pamela Gallagher; Dr. Anne Matthews*
Faculty: *DCU School of Nursing*

Please Circle "Yes" or "No" for the following questions, where appropriate.

I confirm that I am between 40-55 years of age.

Yes / No

I confirm that I have read the Plain Language Statement for the above project and that I understand the information provided therein.

Yes / No

I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

Yes / No

I understand that this consent form will be kept in a location separate from the completed questionnaire and the questionnaire will only collect information that does not identify me by name.

Yes / No

I understand that the anonymous data collected in this study will be used to form the basis of reports, academic publications, conference papers and other scientific publications.

Yes / No

I understand that my participation in this study is voluntary and that I am free to withdraw at any time, without giving any reason and without any penalisation for doing so.

Yes / No

I have read and understood the information in this form. The researchers have answered my questions and concerns, and I have a copy of this consent form. Therefore, I consent to take part in this research project.

Participants Signature: _____

Name in Block Capitals: _____

Witness: _____

Date: _____

APPENDIX C: QUESTIONNAIRES FOR STUDY 1

C1: Mortality Salience Questionnaire

Please state your current age

55-64 ☐ 65-74 ☐ 75+ ☐

Please state your sex

Male ☐ Female ☐

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF YOUR OWN DEATH AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY DIE AND ONCE YOU ARE PHYSICALLY DEAD.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a couple of different passages and answer the questions that follow them. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage. Please follow the instructions provided and complete the questionnaires in the order they are presented. That is, do not skip around.

Opinion Questionnaire 1: Literature

Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver labored to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard he could see the chauffeur's black face, smiling. The man signaled and the chauffeur turned of the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

The man looked at the river below him, visible solely as a broad dark motion flecked with occasional shimmers. A denser motionless darkness, far beyond, must be the other bank. By looking fixedly, however, one could see on that still bank a yellowish light like an oil lamp in the distance. The big man turned back toward the car and nodded. The chauffeur switched off the lights, turned them on again, then blinked them regularly. On the embankment the man appeared and disappeared, taller and more massive each time he came back to life. Suddenly, on the other bank of the river, a lantern held up by an invisible arm back and forth several times. At a final signal from the lookout, the man disappeared into the night. With the lights out, the river was shining intermittently. On each side of the road, the dark masses of forest foliage stood out against the sky and seemed very near. The fine rain that had

soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Opinion Questionnaire 2: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

The CVD Risk Biochip System for Assessing Cardiac Risk

"Cardiovascular Disease" is any disease that affects the heart or the system of blood vessels leading to and from the heart. According to the American Heart Association, such diseases cause more deaths globally each year than any other disease (approximately 30% of all deaths). Also, the World Health Organisation has estimated that at least 20 million people survive heart attacks and strokes every year. Many of these survivors require constant clinical care. This results in a significant number of people with Cardiovascular Disease going through the healthcare system every year. In fact, it is estimated that the disease costs every EU citizen approximately €230 in healthcare per year. The disease also affects the lives of approximately 4.4 million EU citizens every year.

The Biomedical Diagnostics Institute (BDI) in Dublin is developing a diagnostic system that assesses a person's risk of getting Cardiovascular Disease. This system is being designed to be relatively simple to use in order to enable a quick and easy assessment of cardiac risk. By doing so, the BDI hopes to move cardiac risk assessment into General Practitioners' offices, ambulances and the home. These factors could reduce the amount of money spent by EU tax-payers on healthcare for Cardiovascular Disease every year.

How it Works

The system consists of two components; a "CVD Risk Biochip" and a "CVD Risk Biochip" reader. The "CVD Risk Biochip" is a small device that will detect the concentration levels of a number of different proteins in the blood. Taken together, the concentration levels of these proteins can indicate a person's risk for developing future cardiac problems.

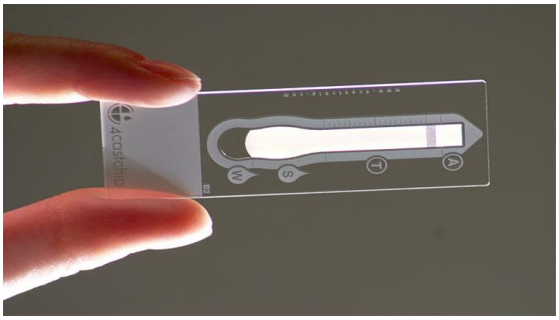

Figure 1: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

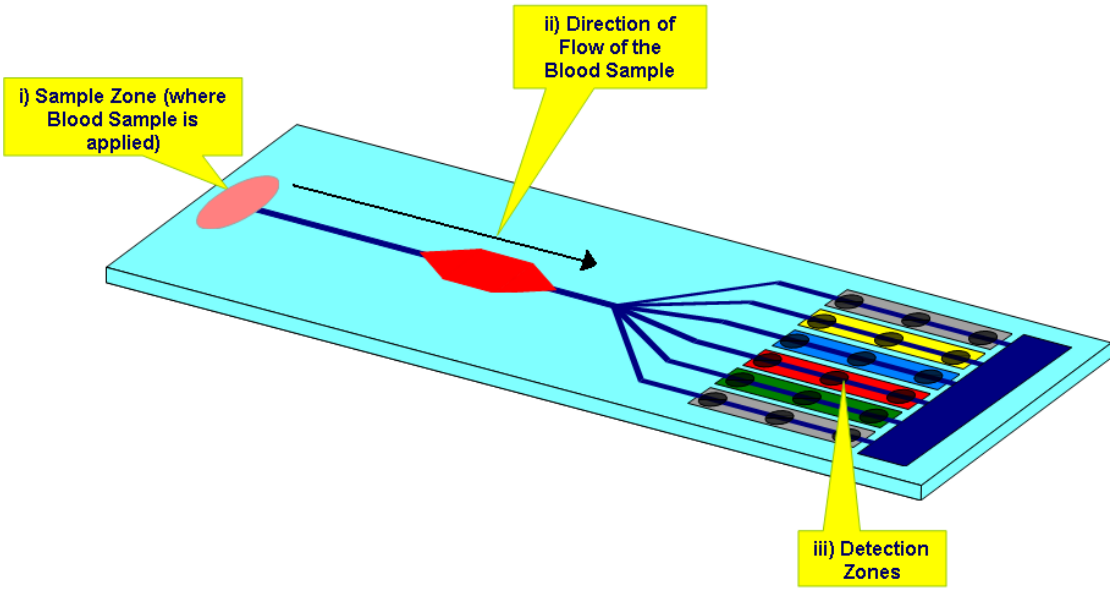

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

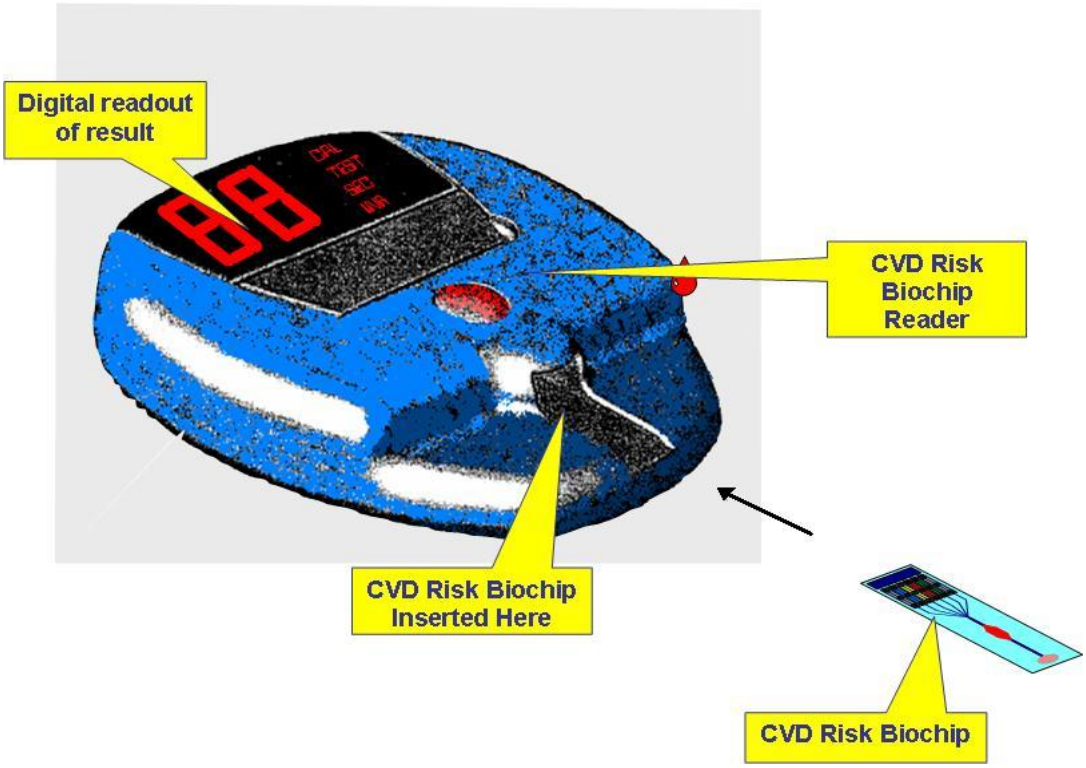

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

11. ***If my GP recommended that I use this device, it is highly likely that I would use it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

12. ***The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

15. ***At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

You have now completed the questionnaire.

Please turn over to the last page of the booklet for further instructions.

The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details in the space below. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead. This information will not be used for any other purpose and will not be made available to any other third party.

Name	Phone Number	Address

C2: Heart Attack Salience Questionnaire

Please state your current age

55-64 ☐ 65-74 ☐ 75+ ☐

Please state your sex

Male ☐ Female ☐

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF HAVING A HEART ATTACK AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY HAVE A HEART ATTACK AND ONCE YOU HAVE PHYSICALLY HAD A HEART ATTACK.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a couple of different passages and answer the questions that follow them. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage. Please follow the instructions provided and complete the questionnaires in the order they are presented. That is, do not skip around.

Opinion Questionnaire 1: Literature

Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver labored to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard he could see the chauffeur's black face, smiling. The man signaled and the chauffeur turned of the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

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soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Opinion Questionnaire 2: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

The CVD Risk Biochip System for Assessing Cardiac Risk

"Cardiovascular Disease" is any disease that affects the heart or the system of blood vessels leading to and from the heart. According to the American Heart Association, such diseases cause more deaths globally each year than any other disease (approximately 30% of all deaths). Also, the World Health Organisation has estimated that at least 20 million people survive heart attacks and strokes every year. Many of these survivors require constant clinical care. This results in a significant number of people with Cardiovascular Disease going through the healthcare system every year. In fact, it is estimated that the disease costs every EU citizen approximately €230 in healthcare per year. The disease also affects the lives of approximately 4.4 million EU citizens every year.

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How it Works

The system consists of two components; a "CVD Risk Biochip" and a "CVD Risk Biochip" reader. The "CVD Risk Biochip" is a small device that will detect the concentration levels of a number of different proteins in the blood. Taken together, the concentration levels of these proteins can indicate a person's risk for developing future cardiac problems.

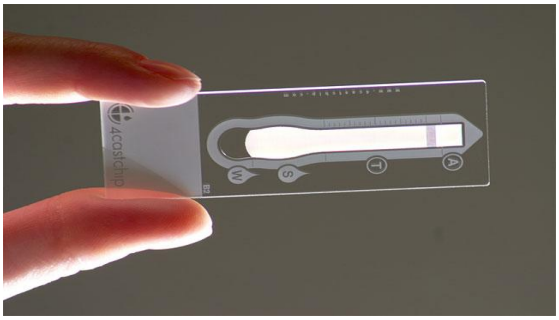

Figure 2: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

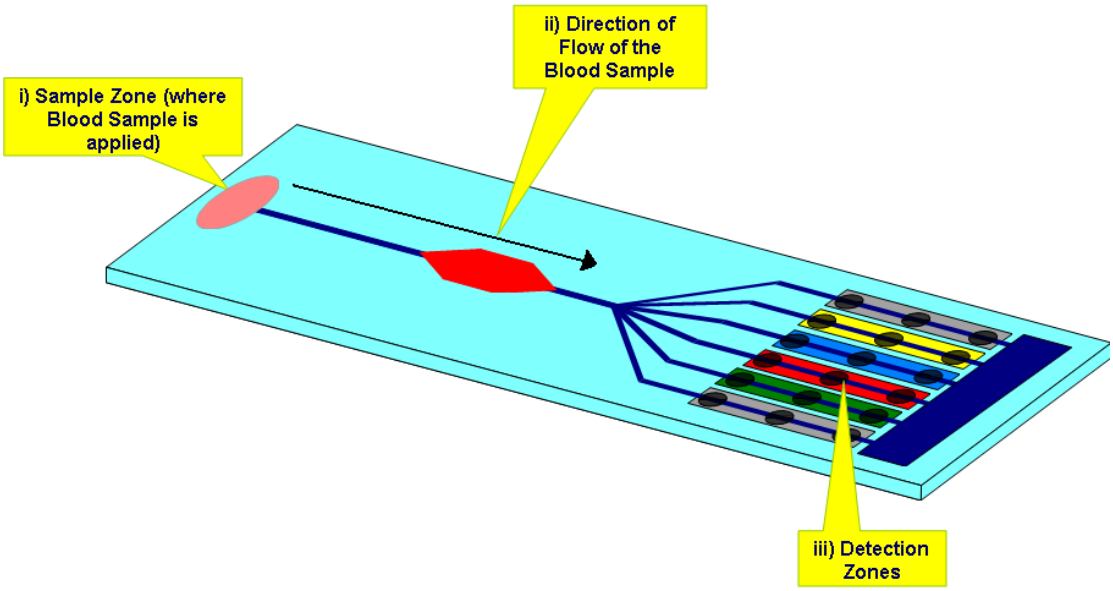

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The

amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

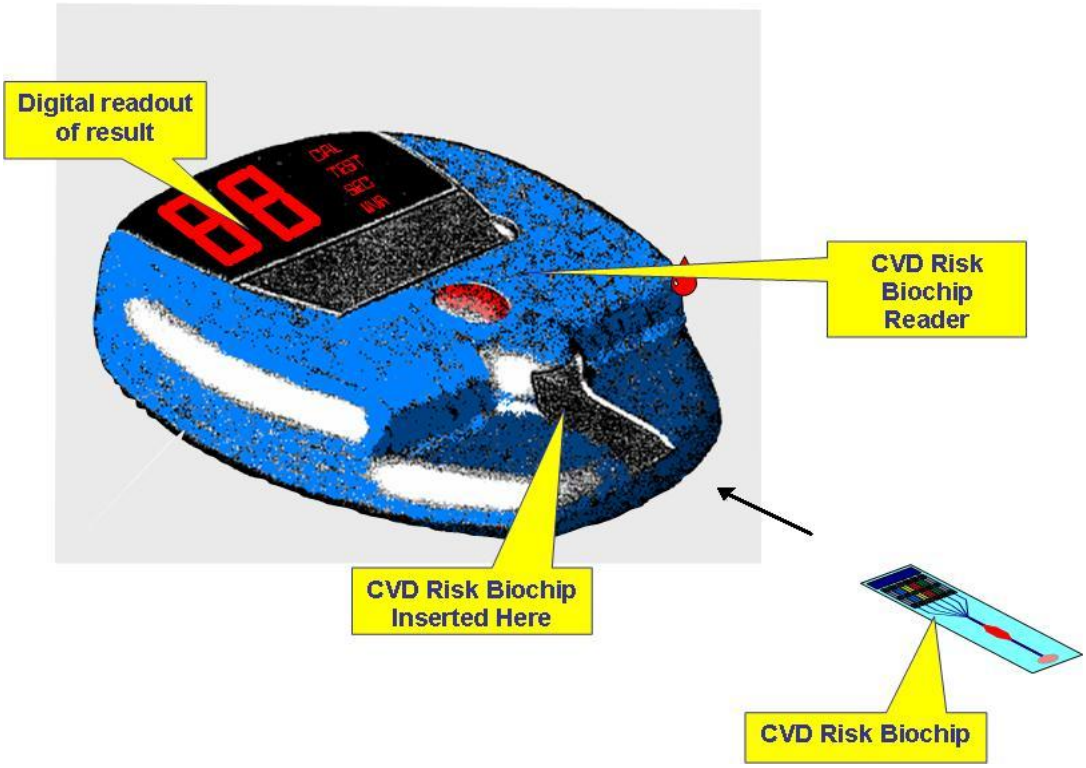

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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11. ***If my GP recommended that I use this device, it is highly likely that I would use it.***

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12. ***The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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14. At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

15. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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You have now completed the questionnaire.

Please turn over to the last page of the booklet for further instructions.

The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details in the space below. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead. This information will not be used for any other purpose and will not be made available to any other third party.

Name	Phone Number	Address

C3: Control Questionnaire

Please state your current age

55-64 ☐ 65-74 ☐ 75+ ☐

Please state your sex

Male ☐ Female ☐

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF EXPERIENCING DENTAL PAIN AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY EXPERIENCE DENTAL PAIN AND ONCE YOU HAVE PHYSICALLY EXPERIENCED DENTAL PAIN.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a couple of different passages and answer the questions that follow them. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage. Please follow the instructions provided and complete the questionnaires in the order they are presented. That is, do not skip around.

Opinion Questionnaire 1: Literature

Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

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soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
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2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Opinion Questionnaire 2: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

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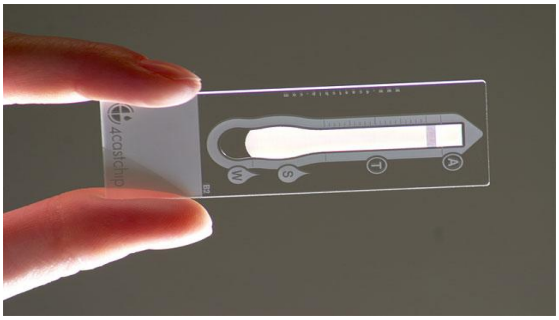

Figure 3: CVD Risk Biochip (approximate size)

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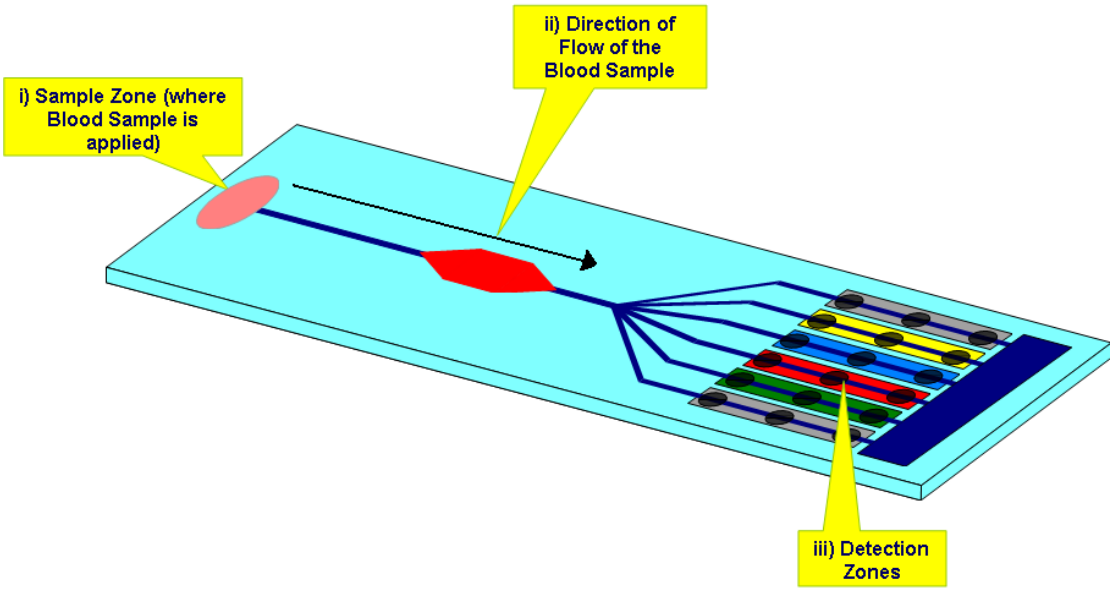

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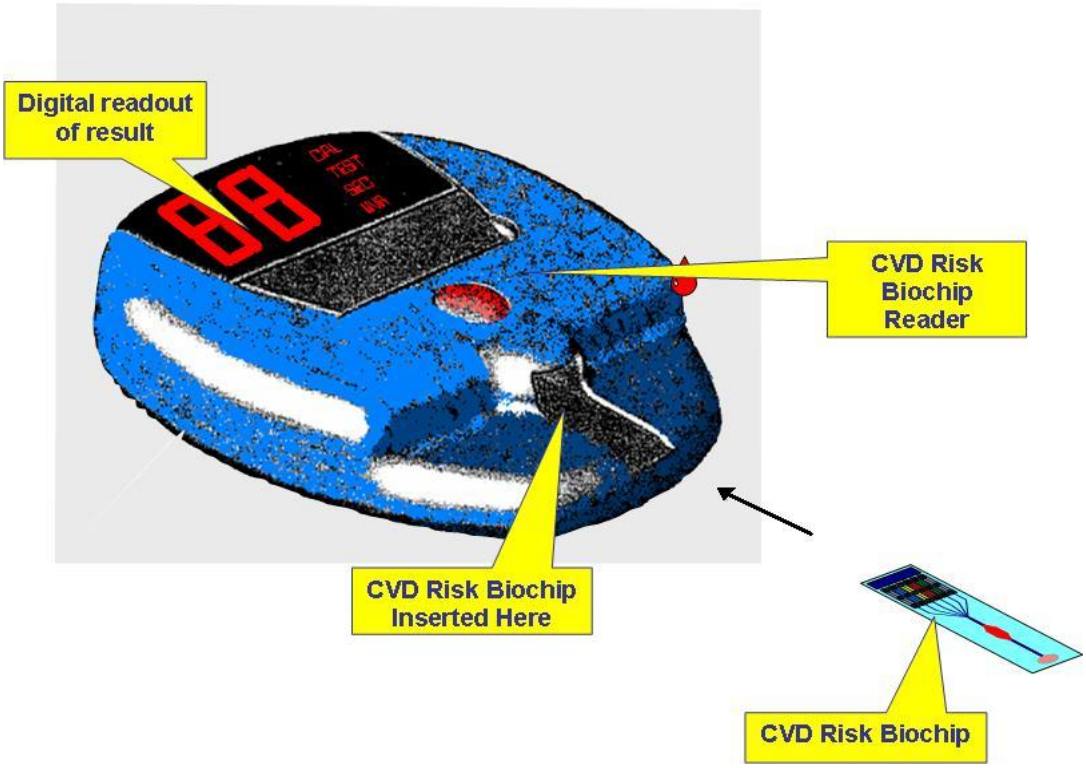

Figure 3: CVD Risk Biochip and Reader

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1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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3. ***The CVD Risk Biochip makes me feel empowered about my health.***

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5. ***The CVD Risk Biochip is a valuable new device.***

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6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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9. ***The CVD Risk Biochip is an unnecessary device.***

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10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

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Name	Phone Number	Address

APPENDIX D: QUESTIONNAIRES FOR STUDY 2

D1: Mortality Salience Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF YOUR OWN DEATH AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY DIE AND ONCE YOU ARE PHYSICALLY DEAD.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a couple of different passages and answer the questions that follow them. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage. Please follow the instructions provided and complete the questionnaires in the order they are presented. That is, do not skip around.

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1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

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Recent research has demonstrated that high risk for developing Cardiovascular Disease begins in middle-age. In particular, this research has shown that people with just one risk factor for Cardiovascular Disease in middle age have a strong chance of developing the disease in later life. Furthermore, such people have a much higher risk of death from Cardiovascular Disease and a shorter estimated survival time for the disease.

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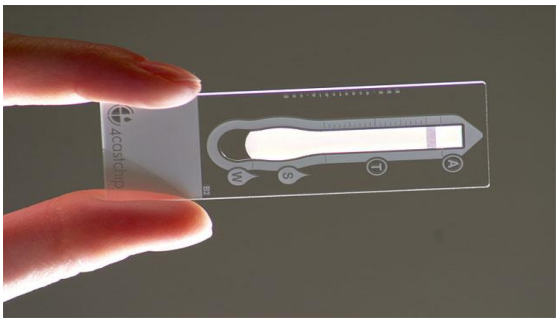

Figure 4: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

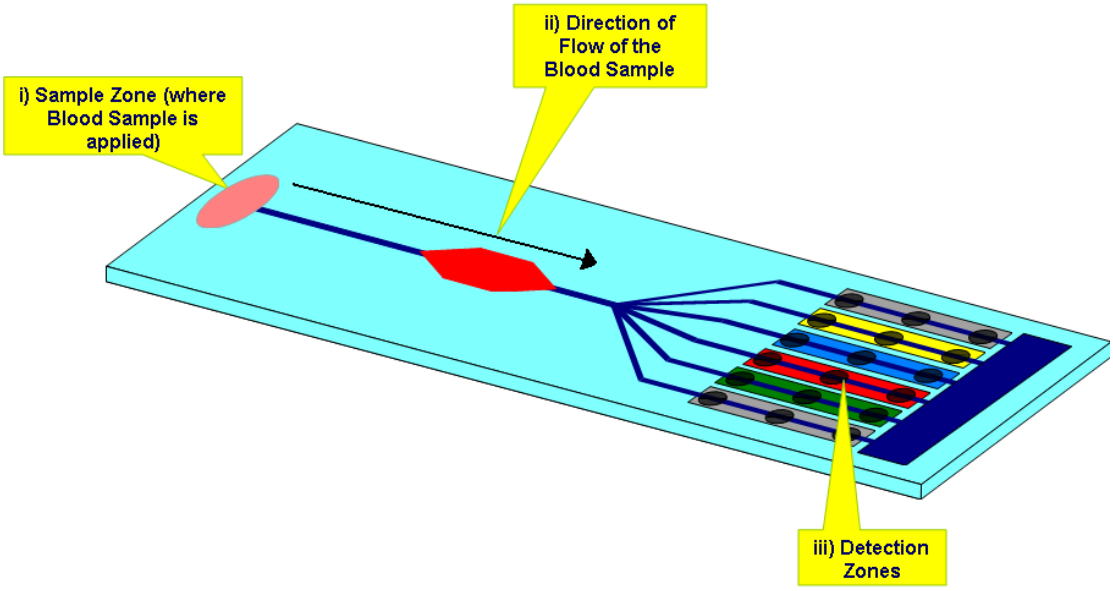

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

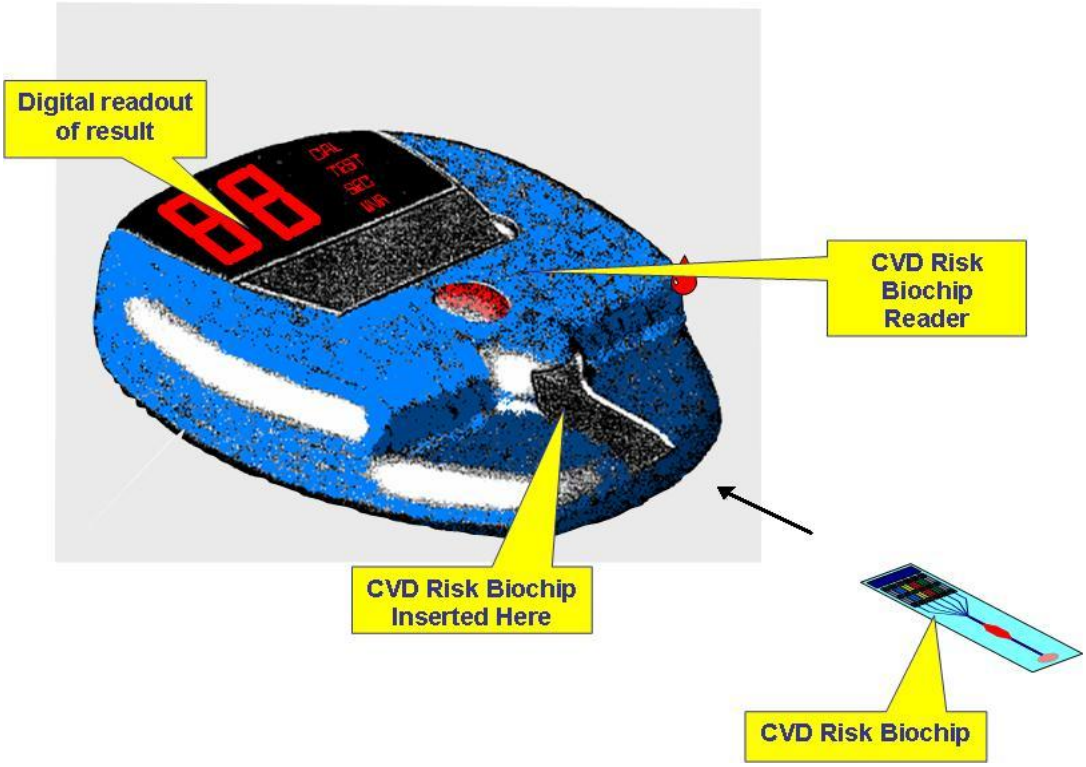

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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12. ***The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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15. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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You have now completed the questionnaire.

Please turn over to the last page of the booklet for further instructions.

The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details in the space below. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead. This information will not be used for any other purpose and will not be made available to any other third party.

Name	Phone Number	Address

D2: Heart Attack Salience Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF HAVING A HEART ATTACK AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY HAVE A HEART ATTACK AND ONCE YOU HAVE PHYSICALLY HAD A HEART ATTACK.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a couple of different passages and answer the questions that follow them. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage. Please follow the instructions provided and complete the questionnaires in the order they are presented. That is, do not skip around.

Opinion Questionnaire 1: Literature

Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver labored to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard he could see the chauffeur's black face, smiling. The man signaled and the chauffeur turned of the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

The man looked at the river below him, visible solely as a broad dark motion flecked with occasional shimmers. A denser motionless darkness, far beyond, must be the other bank. By looking fixedly, however, one could see on that still bank a yellowish light like an oil lamp in the distance. The big man turned back toward the car and nodded. The chauffeur switched off the lights, turned them on again, then blinked them regularly. On the embankment the man appeared and disappeared, taller and more massive each time he came back to life. Suddenly, on the other bank of the river, a lantern held up by an invisible arm back and forth several times. At a final signal from the lookout, the man disappeared into the night. With the lights out, the river was shining intermittently. On each side of the road, the dark masses of forest foliage stood out against the sky and seemed very near. The fine rain that had

soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Opinion Questionnaire 2: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

The CVD Risk Biochip System for Assessing Cardiac Risk

"Cardiovascular Disease" is any disease that affects the heart or the system of blood vessels leading to and from the heart. According to the American Heart Association, such diseases cause more deaths globally each year than any other disease (approximately 30% of all deaths). Also, the World Health Organisation has estimated that at least 20 million people survive heart attacks and strokes every year. Many of these survivors require constant clinical care. This results in a significant number of people with Cardiovascular Disease going through the healthcare system every year. In fact, it is estimated that the disease costs every EU citizen approximately €230 in healthcare per year. The disease also affects the lives of approximately 4.4 million EU citizens every year.

Recent research has demonstrated that high risk for developing Cardiovascular Disease begins in middle-age. In particular, this research has shown that people with just one risk factor for Cardiovascular Disease in middle age have a strong chance of developing the disease in later life. Furthermore, such people have a much higher risk of death from Cardiovascular Disease and a shorter estimated survival time for the disease.

The Biomedical Diagnostics Institute (BDI) in Dublin is developing a diagnostic system that assesses a person's risk of getting Cardiovascular Disease. This system is being designed to be relatively simple to use in order to enable a quick and easy assessment of cardiac risk. By doing so, the BDI hopes to move cardiac risk assessment into General Practitioners' offices, ambulances and the home. These factors could reduce the amount of money spent by EU tax-payers on healthcare for Cardiovascular Disease every year.

How it Works

The system consists of two components; a “CVD Risk Biochip” and a “CVD Risk Biochip” reader. The “CVD Risk Biochip” is a small device that will detect the concentration levels of a number of different proteins in the blood. Taken together, the concentration levels of these proteins can indicate a person’s risk for developing future cardiac problems.

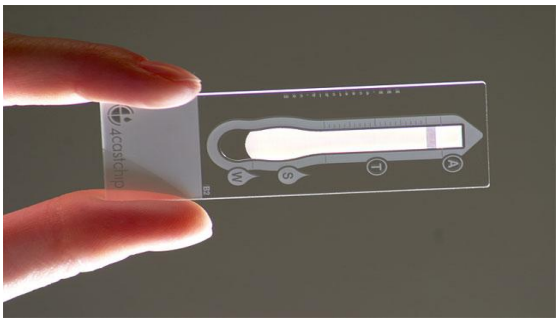

Figure 5: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

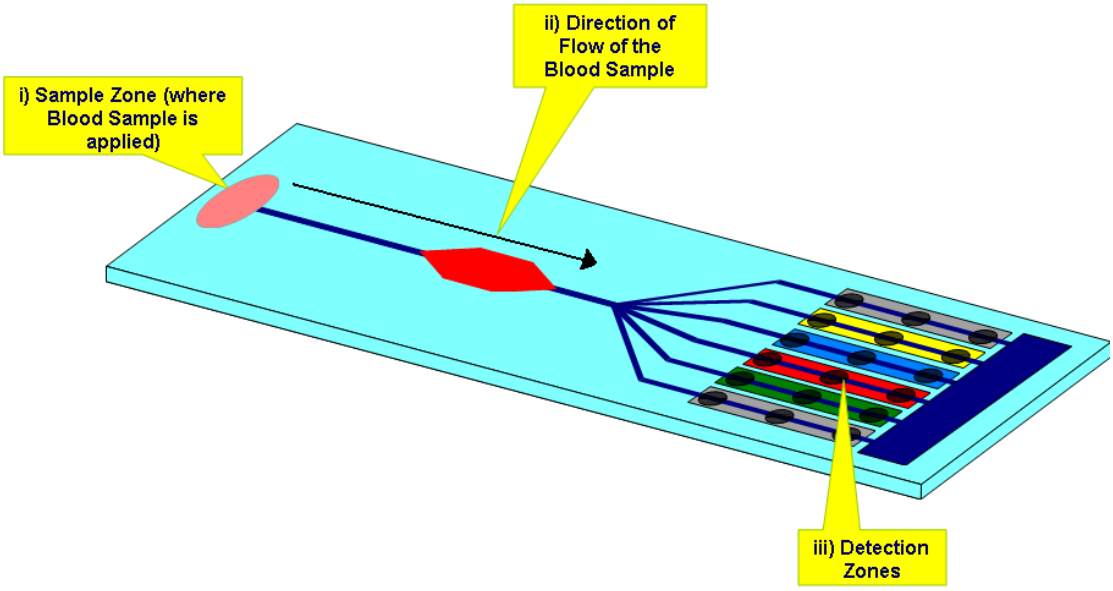

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

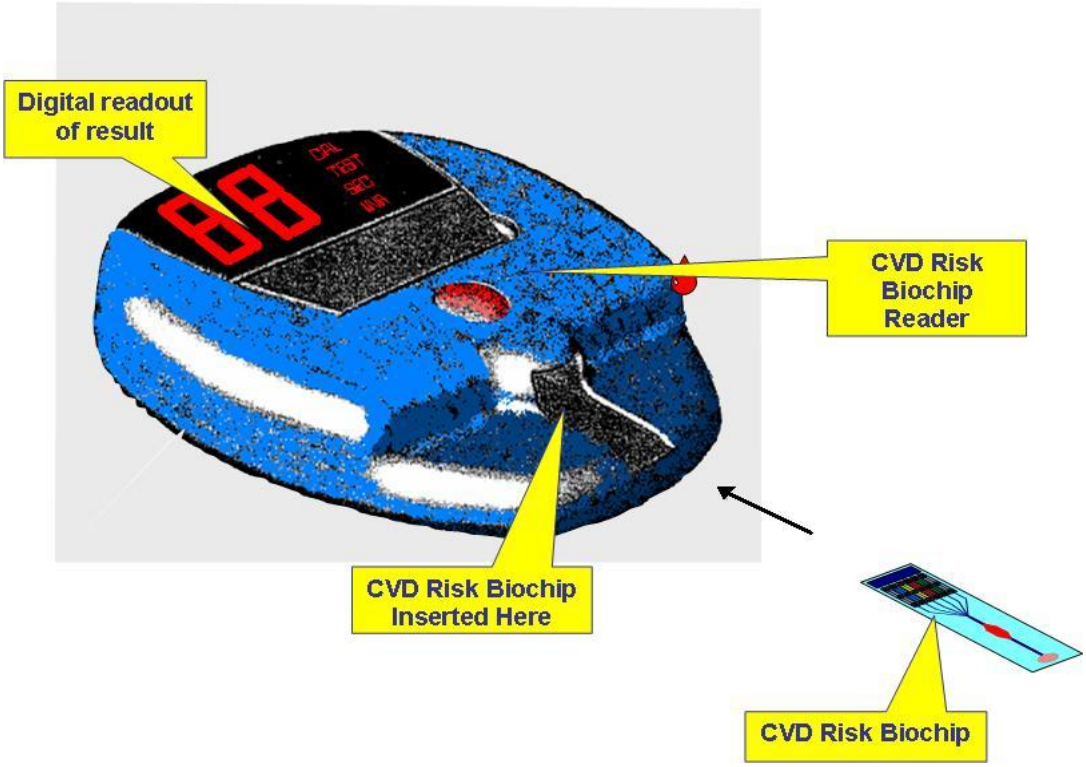

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

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Name	Phone Number	Address

D3: Control Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF EXPERIENCING DENTAL PAIN AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY EXPERIENCE DENTAL PAIN AND ONCE YOU HAVE PHYSICALLY EXPERIENCED DENTAL PAIN.

_____
_____
_____
_____
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On the following pages, you will be asked to read a couple of different passages and answer the questions that follow them. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage. Please follow the instructions provided and complete the questionnaires in the order they are presented. That is, do not skip around.

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1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Opinion Questionnaire 2: The "CVD Risk Biochip"

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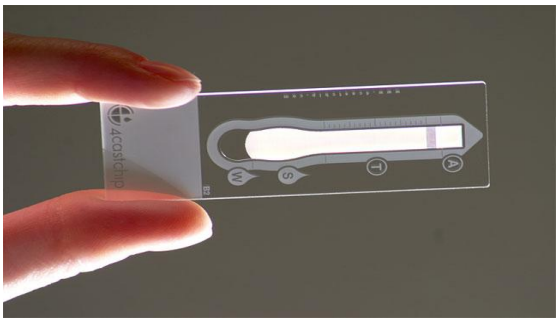
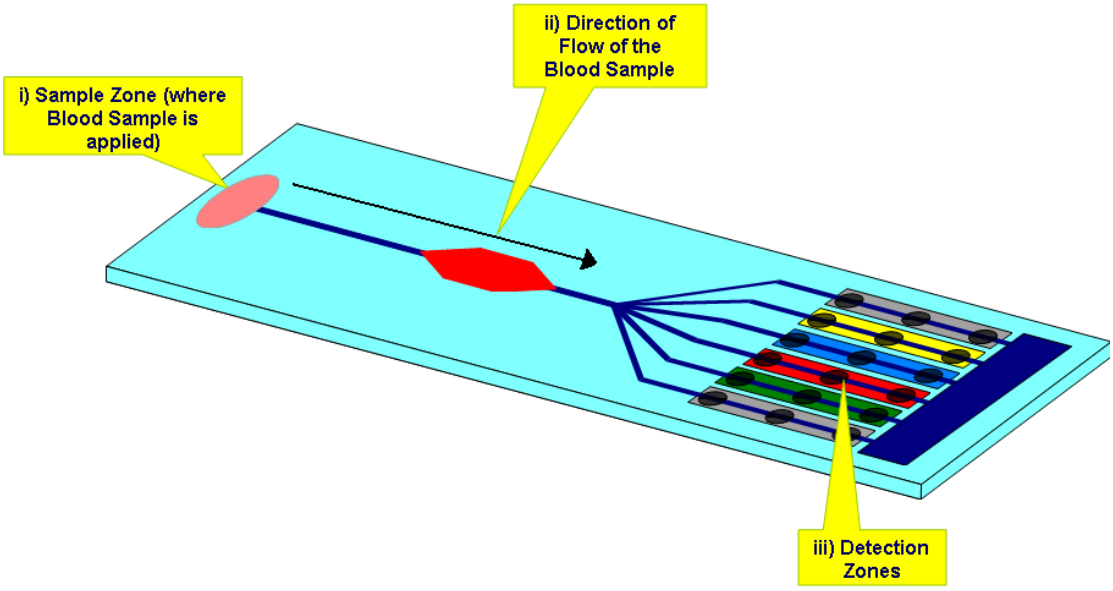


Figure 6: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.



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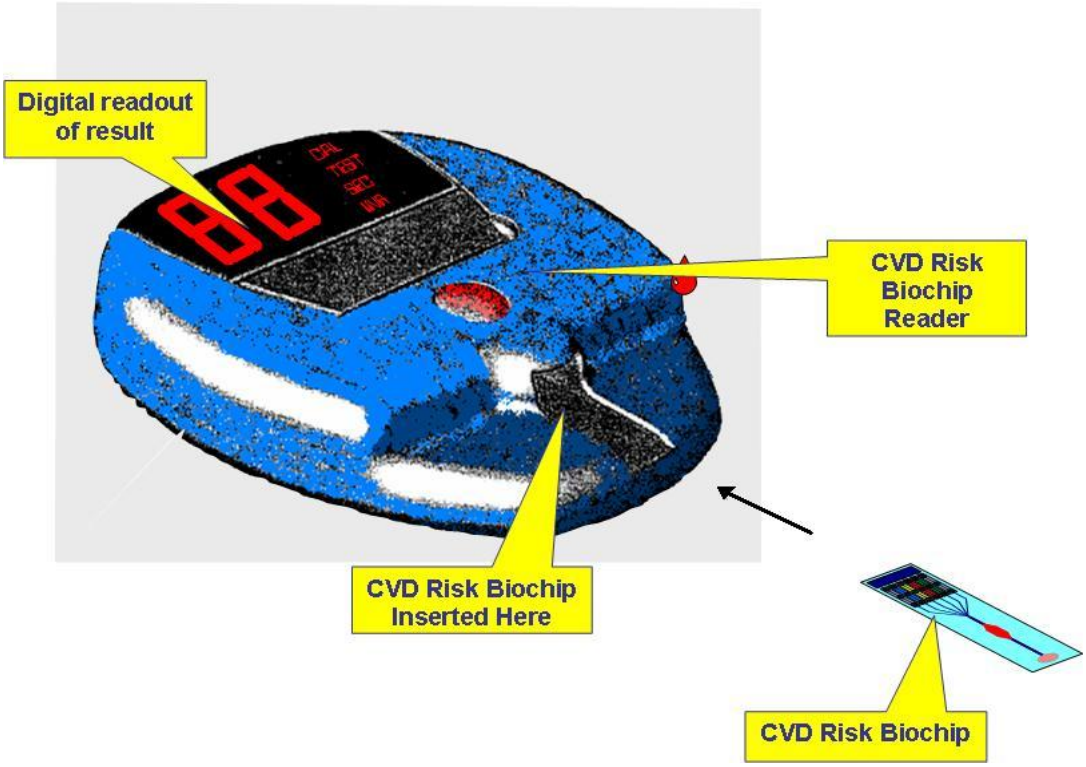

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

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3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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15. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.

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You have now completed the questionnaire.

Please turn over to the last page of the booklet for further instructions.

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Name	Phone Number	Address

APPENDIX E: QUESTIONNAIRES FOR STUDY 3

E1: Heart Attack Salience/Distraction Questionnaire

Please state your current age

_____

Please state your sex

Male ☐ Female ☐

Please follow the instructions provided on the following pages and complete the questionnaires in the order they are presented.

It is extremely important that you do not skip around, talk to anybody else who may be next to you about any of the questions or refer back to any previous part of the booklet.

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF HAVING A HEART ATTACK AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY HAVE A HEART ATTACK AND ONCE YOU HAVE PHYSICALLY HAD A HEART ATTACK.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a short passage and answer the questions that follow it. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage.

LITERATURE TASK

Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver labored to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard he could see the chauffeur's black face, smiling. The man signaled and the chauffeur turned of the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

The man looked at the river below him, visible solely as a broad dark motion flecked with occasional shimmers. A denser motionless darkness, far beyond, must be the other bank. By looking fixedly, however, one could see on that still bank a yellowish light like an oil lamp in the distance. The big man turned back toward the car and nodded. The chauffeur switched off the lights, turned them on again, then blinked them regularly. On the embankment the man appeared and disappeared, taller and more massive each time he came back to life. Suddenly, on the other bank of the river, a lantern held up by an invisible arm back and forth several times. At a final signal from the lookout, the man disappeared into the night. With the lights out, the river was shining intermittently. On each side of the road, the dark masses of forest foliage

stood out against the sky and seemed very near. The fine rain that had soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Please complete the word fragments on the following page by filling letters in the blanks to create words.

WORD COMPLETION TASK

Please fill in the blanks with the first word that comes to mind. Write one letter per blank. Some words may be plural. Thank you.

1. BUR _ _ D
2. PLA _ _
3. _ _ OK
4. WAT _ _
5. DE _ _
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7. _ _ NG
8. B _ T _ LE
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10. P _ _ TURE
11. FL _ W _ R
12. GRA _ _
13. K _ _GS
14. CHA _ _
15. KI _ _ ED
16. CL _ _ K
17. TAB _ _
18. W _ _ DOW
19. SK _ _ L
20. TR _ _
21. P _ P _ R
22. COFF _ _
23. _ O _ SE
24. POST _ _
25. R _ DI _

You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

E2: Heart Attack Salience/Cognitive Load Questionnaire

Please state your current age

_____

Please state your sex

Male ☐ Female ☐

Please follow the instructions provided on the following pages and complete the questionnaires in the order they are presented.

It is extremely important that you do not skip around, talk to anybody else who may be next to you about any of the questions or refer back to any previous part of the booklet.

Please take no more than 30 seconds to memorise the following number, which you will be asked to recall later:

98730524816

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF HAVING A HEART ATTACK AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY HAVE A HEART ATTACK AND ONCE YOU HAVE PHYSICALLY HAD A HEART ATTACK.

_____
_____
_____
_____
_____
_____
_____

Please complete the word fragments on the following page by filling letters in the blanks to create words.

WORD COMPLETION TASK

Please fill in the blanks with the first word that comes to mind. Write one letter per blank. Some words may be plural. Thank you.

1. BUR _ _ D
2. PLA _ _
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11. FL _ W _ R
12. GRA _ _
13. K _ _GS
14. CHA _ _
15. KI _ _ ED
16. CL _ _ K
17. TAB _ _
18. W _ _ DOW
19. SK _ _ L
20. TR _ _
21. P _ P _ R
22. COFF _ _
23. _ O _ SE
24. POST _ _
25. R _ DI _

Please write down the 11-digit number that you were asked to memorise in the space below. Once you have done so you can forget it.

You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

E3: Control/Distraction Questionnaire

Please state your current age

_____

Please state your sex

Male ☐ Female ☐

Please follow the instructions provided on the following pages and complete the questionnaires in the order they are presented.

It is extremely important that you do not skip around, talk to anybody else who may be next to you about any of the questions or refer back to any previous part of the booklet.

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF EXPERIENCING DENTAL PAIN AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY EXPERIENCE DENTAL PAIN AND ONCE YOU HAVE PHYSICALLY EXPERIENCED DENTAL PAIN.

_____
_____
_____
_____
_____
_____
_____

On the following pages, you will be asked to read a short passage and answer the questions that follow it. These questions will mainly ask you to give your opinion about certain aspects of the preceding passage.

LITERATURE TASK

Please read the following short passage from a novel and answer the questions below it.

The automobile swung clumsily around the curve in the red sandstone trail, now a mass of mud. The headlights suddenly picked out in the night—first on one side of the road, then on the other—two wooden huts with sheet metal roofs. On the right near the second one, a tower of course beams could be made out in the light fog. From the top of the tower a metal cable, invisible at its starting-point, shone as it sloped down into the light from the car before disappearing behind the embankment that blocked the road. The car slowed down and stopped a few yards from the huts.

The man who emerged from the seat to the right of the driver labored to extricate himself from the car. As he stood up, his huge, broad frame lurched a little. In the shadow beside the car, solidly planted on the ground and weighed down by fatigue, he seemed to be listening to the idling motor. Then he walked in the direction of the embankment and entered the cone of light from the headlights. He stopped at the top of the slope, his broad back outlined against the darkness. After a moment he turned around. In the light from the dashboard he could see the chauffeur's black face, smiling. The man signaled and the chauffeur turned of the motor. At once a vast cool silence fell over the trail and the forest. Then the sound of the water could be heard.

The man looked at the river below him, visible solely as a broad dark motion flecked with occasional shimmers. A denser motionless darkness, far beyond, must be the other bank. By looking fixedly, however, one could see on that still bank a yellowish light like an oil lamp in the distance. The big man turned back toward the car and nodded. The chauffeur switched off the lights, turned them on again, then blinked them regularly. On the embankment the man appeared and disappeared, taller and more massive each time he came back to life. Suddenly, on the other bank of the river, a lantern held up by an invisible arm back and forth several times. At a final signal from the lookout, the man disappeared into the night. With the lights out, the river was shining intermittently. On each side of the road, the dark masses of forest foliage

stood out against the sky and seemed very near. The fine rain that had soaked the trail an hour earlier was still hovering in the warm air, intensifying the silence and immobility of this broad clearing in the virgin forest. In the black sky misty stars flickered.

1. ***How do you feel about the overall descriptive qualities of the story? (Please rate it on the following scale from 1-9, where 1 indicates that it is not at all descriptive and 9 indicates that it is very descriptive)***

not at all descriptive			somewhat descriptive			very descriptive		
1	2	3	4	5	6	7	8	9

2. ***Do you think the author of this story is male or female?***

_____ Male _____ Female

Please complete the word fragments on the following page by filling letters in the blanks to create words.

WORD COMPLETION TASK

Please fill in the blanks with the first word that comes to mind. Write one letter per blank. Some words may be plural. Thank you.

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9. M_ J _ R
10. P _ _ TURE
11. FL _ W _ R
12. GRA _ _
13. K _ _GS
14. CHA _ _
15. KI _ _ ED
16. CL _ _ K
17. TAB _ _
18. W _ _ DOW
19. SK _ _ L
20. TR _ _
21. P _ P _ R
22. COFF _ _
23. _ O _ SE
24. POST _ _
25. R _ DI _

You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

E4: Control/Cognitive Load Questionnaire

Please state your current age

_____

Please state your sex

Male ☐ Female ☐

Please follow the instructions provided on the following pages and complete the questionnaires in the order they are presented.

It is extremely important that you do not skip around, talk to anybody else who may be next to you about any of the questions or refer back to any previous part of the booklet.

Please take no more than 30 seconds to memorise the following number, which you will be asked to recall later:

98730524816

On the following page are two open-ended questions, please respond to them with your first, natural response.

We are looking for peoples' gut-level reactions to these questions.

The Projective Life Attitudes Assessment

1. PLEASE BRIEFLY DESCRIBE THE EMOTIONS THAT THE THOUGHT OF EXPERIENCING DENTAL PAIN AROUSES IN YOU.

_____
_____
_____
_____
_____
_____
_____

2. JOT DOWN, AS SPECIFICALLY AS YOU CAN, WHAT YOU THINK WILL HAPPEN TO YOU AS YOU PHYSICALLY EXPERIENCE DENTAL PAIN AND ONCE YOU HAVE PHYSICALLY EXPERIENCED DENTAL PAIN.

_____
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_____

Please complete the word fragments on the following page by filling letters in the blanks to create words.

WORD COMPLETION TASK

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17. TAB _ _
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Please write down the 11-digit number that you were asked to memorise in the space below. Once you have done so you can forget it.

You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

APPENDIX F: QUESTIONNAIRES FOR STUDY 4

F1: Creatureliness Prime/Self-Esteem Threat Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

In the following questionnaire booklet, you will be asked to complete several different questionnaires on various topics relating to personality and health. Please respond to them with your first, natural response.

We are looking for people's gut-level reactions to these questions.

LIFE EVENTS ASSESSMENT

The following task asks you to think about and describe an important life event. Since life events help shape personality, knowing about some personal experiences you have had will help us better understand your personality. Your honest responses to the following questions will be appreciated. Remember, all of your responses are completely anonymous.

PLEASE BRIEFLY THINK ABOUT AND DESCRIBE A TIME IN WHICH YOU FAILED TO LIVE UP TO ONE OF YOUR MOST IMPORTANT VALUES. THAT IS, DESCRIBE ONE OF YOUR GREATEST PERSONAL FAILURES.

_____

_____

_____

_____

_____

_____

_____

_____

HOW DID THIS PERSONAL FAILURE MAKE YOU FEEL?

_____

_____

_____

_____

_____

_____

_____

On the following page you will receive an essay randomly selected from a pool of essays written by honour students at the University of Missouri-St. Louis. Please read the essay at your own pace. At the end of the study there will be a couple of questions about the essay. The questions will be looking for your first natural gut impression of the essay.

THE FOLLOWING SHORT ESSAY WAS A SENIOR HONORS STUDENT AT UNIVERSITY OF MISSOURI-ST. LOUIS. STUDENTS WERE ASKED TO WRITE ON THE TOPIC: THE MOST IMPORTANT THINGS I HAVE LEARNED ABOUT HUMAN NATURE.

The boundary between humans and animals is not as great as most people think. Although we like to think that we are special and unique, our bodies work in pretty much the same way as the bodies of all other animals. Whether you're talking about lizards, cows, horses, insects, or humans, we're all made up of the same basic biological products. We're all made up of skin, blood, organs, and bones. We're all driven by needs for food, water, sex, and comfort. Although some people like to claim that we humans are vastly more intelligent than other animals, this doesn't really seem to be true. What appears to be the results of complex thought and free will is really just the result of our biological programming and simple learning experiences, just like all other animals. Research shows that chimps have the capacity for language, even pigeons are able to solve pretty complex problems, and all animals show caring for and attachment to their offspring. Human beings are just another species of animals, maybe a little more intelligent than others, but not different in any really important or meaningful way. Seeing ourselves as special or different from the cows we eat for lunch or the insects we wash off our windshields is just another example of human vanity and self-delusion.

WORD SEARCH PUZZLE

Circle as many words as you can in the puzzle below.

Book	Computer	Beer
Desk	Phone	Actor
Movie	Train	Music
Paper	School	Grass

S R E T U P M O C O

W P H O N E R E E B

A M U S I C P Z S N

B T N R O T C A S K

B M R K S E D E A O

R F O A G O L B R O

E L G V I Z B O G B

P A N U I N E L W Q

A G T A B E T G D O

P S C H O O L N I T

Opinion Questionnaire 1: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

The CVD Risk Biochip System for Assessing Cardiac Risk

"Cardiovascular Disease" is any disease that affects the heart or the system of blood vessels leading to and from the heart. According to the American Heart Association, such diseases cause more deaths globally each year than any other disease (approximately 30% of all deaths). Also, the World Health Organisation has estimated that at least 20 million people survive heart attacks and strokes every year. Many of these survivors require constant clinical care. This results in a significant number of people with Cardiovascular Disease going through the healthcare system every year. In fact, it is estimated that the disease costs every EU citizen approximately €230 in healthcare per year. The disease also affects the lives of approximately 4.4 million EU citizens every year.

Recent research has demonstrated that high risk for developing Cardiovascular Disease begins in middle-age. In particular, this research has shown that both males and females with just one risk factor for Cardiovascular Disease in middle age have a strong chance of developing the disease in later life. Furthermore, such people have a much higher risk of death from Cardiovascular Disease and a shorter estimated survival time for the disease.

The Biomedical Diagnostics Institute (BDI) in Dublin is developing a diagnostic system that assesses a person's risk of getting Cardiovascular Disease. This system is being designed to be relatively simple to use in order to enable a quick and easy assessment of cardiac risk. By doing so, the BDI hopes to move cardiac risk assessment into General Practitioners' offices, ambulances and the home. These factors could reduce the amount of money spent by EU tax-payers on healthcare for Cardiovascular Disease every year.

How it Works

The system consists of two components; a “CVD Risk Biochip” and a “CVD Risk Biochip” reader. The “CVD Risk Biochip” is a small device that will detect the concentration levels of a number of different proteins in the blood. Taken together, the concentration levels of these proteins can indicate a person’s risk for developing future cardiac problems.

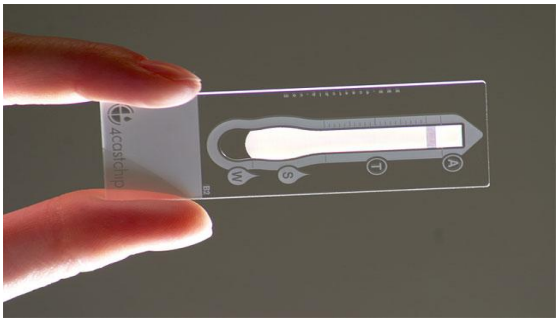

Figure 1: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

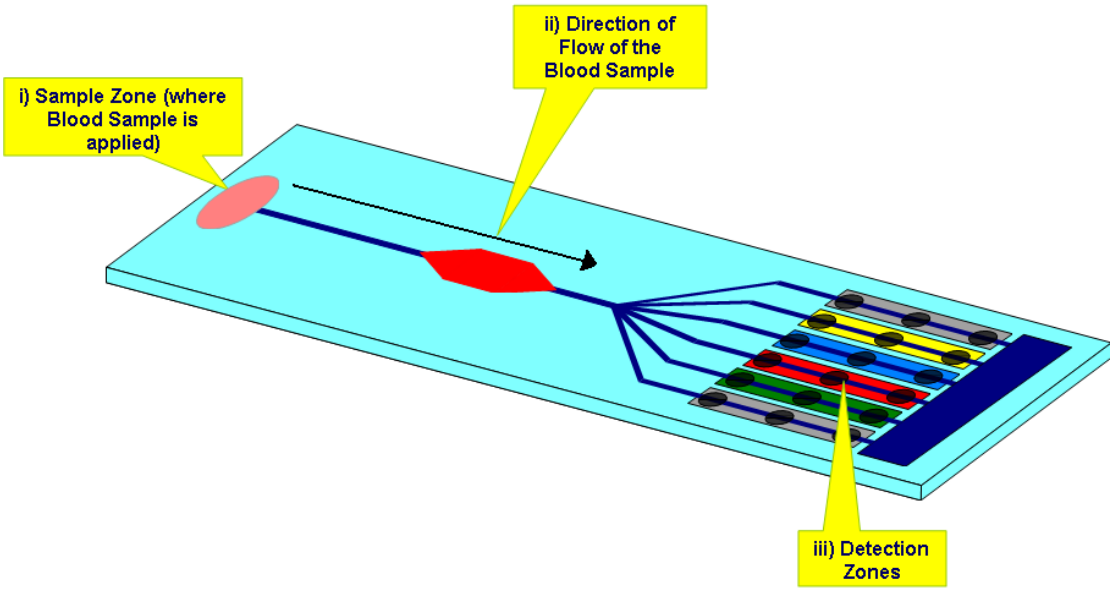

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

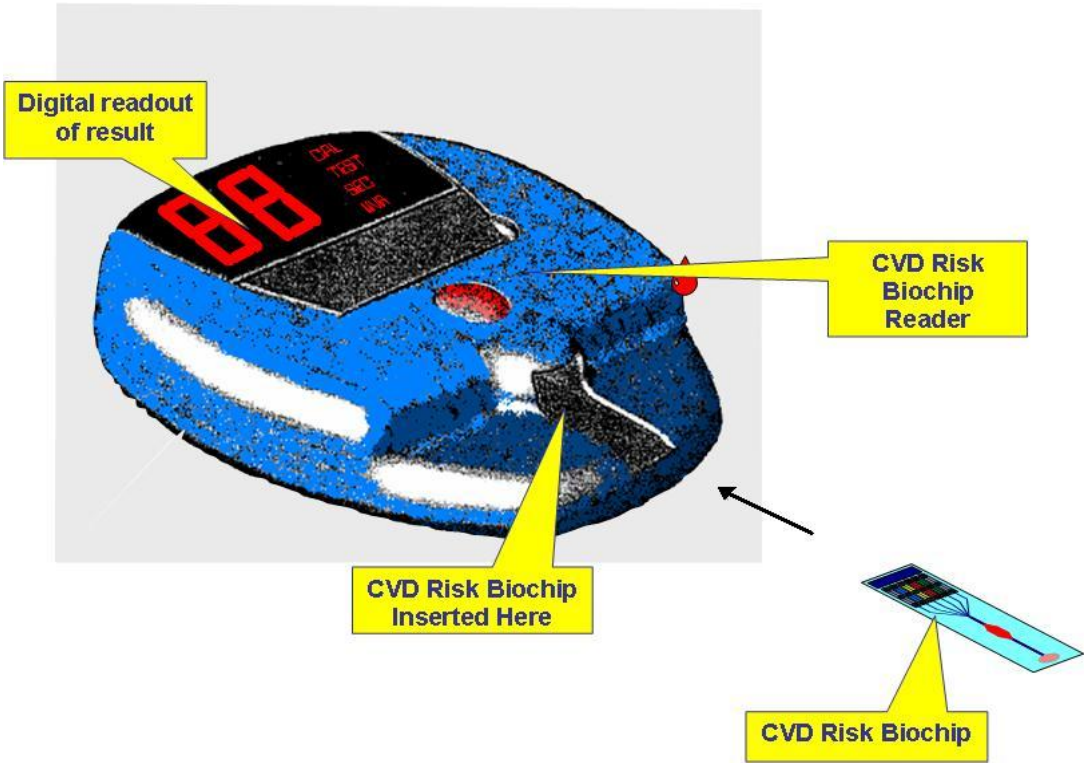

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

11. ***If my GP recommended that I use this device, it is highly likely that I would use it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

12. ***The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

15. ***At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

Opinion Questionnaire 2: Diagnostic Technology

Diagnostic detection of risk factors for diseases like CVD is potentially becoming easier with technologies like the CVD Risk Biochip described earlier. Specifically, devices like the CVD Risk Biochip are being developed with a view to being used in the home as an indication for future risk of developing CVD. Try to clearly imagine what it might be like to use a technology like the CVD Risk Biochip yourself (for example, using the device in your own home) and answer the questions that follow. Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement. Please respond to them with your first, natural response.

1. ***The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***I would be skeptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

CVD Risk Biochip Pilot Study Sign-up Sheet (Optional)

The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details in the space below. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead. This information will not be used for any other purpose and will not be made available to any other third party.

Name	Phone Number	Address

Opinion Questionnaire 3: Literature Evaluation

Please recall the earlier essay that was presented in the Questionnaire Booklet concerning "The most important things that I have learned about human nature" and answer the questions that follow. Please respond to them with your first, natural response.

1. ***How much do you think you would like this person?***

   Not at all Somewhat Very much

   1 2 3 4 5 6 7 8 9

2. ***How intelligent do you believe this person to be?***

   Not at all Somewhat Very intelligent

   1 2 3 4 5 6 7 8 9

3. ***How knowledgeable do you believe this person to be?***

   Not at all Somewhat Very knowledgeable

   1 2 3 4 5 6 7 8 9

4. ***Is this person's opinion well-informed?***

   Not at all Somewhat Very well-informed

   1 2 3 4 5 6 7 8 9

5. ***How much do you agree with this person's opinion?***

   Not at all Somewhat Very much

   1 2 3 4 5 6 7 8 9

6. ***From your perspective, how true do you think this person's opinion is of the topic they discussed?***

   Not at all Somewhat Very true

   1 2 3 4 5 6 7 8 9

You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

F2: Creatureliness Prime/Self-Esteem Bolster Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

In the following questionnaire booklet, you will be asked to complete several different questionnaires on various topics relating to personality and health. Please respond to them with your first, natural response.

We are looking for people's gut-level reactions to these questions.

LIFE EVENTS ASSESSMENT

The following task asks you to think about and describe an important life event. Since life events help shape personality, knowing about some personal experiences you have had will help us better understand your personality. Your honest responses to the following questions will be appreciated. Remember, all of your responses are completely anonymous.

PLEASE BRIEFLY THINK ABOUT AND DESCRIBE A TIME IN WHICH YOU SUCCESSFULLY LIVED UP TO ONE OF YOUR MOST IMPORTANT VALUES. THAT IS, DESCRIBE ONE OF YOUR GREATEST PERSONAL SUCCESSES.

_____

_____

_____

_____

_____

_____

_____

_____

HOW DID THIS PERSONAL SUCCESS MAKE YOU FEEL?

_____

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THE FOLLOWING SHORT ESSAY WAS A SENIOR HONORS STUDENT AT UNIVERSITY OF MISSOURI-ST. LOUIS. STUDENTS WERE ASKED TO WRITE ON THE TOPIC: THE MOST IMPORTANT THINGS I HAVE LEARNED ABOUT HUMAN NATURE.

The boundary between humans and animals is not as great as most people think. Although we like to think that we are special and unique, our bodies work in pretty much the same way as the bodies of all other animals. Whether you're talking about lizards, cows, horses, insects, or humans, we're all made up of the same basic biological products. We're all made up of skin, blood, organs, and bones. We're all driven by needs for food, water, sex, and comfort. Although some people like to claim that we humans are vastly more intelligent than other animals, this doesn't really seem to be true. What appears to be the results of complex thought and free will is really just the result of our biological programming and simple learning experiences, just like all other animals. Research shows that chimps have the capacity for language, even pigeons are able to solve pretty complex problems, and all animals show caring for and attachment to their offspring. Human beings are just another species of animals, maybe a little more intelligent than others, but not different in any really important or meaningful way. Seeing ourselves as special or different from the cows we eat for lunch or the insects we wash off our windshields is just another example of human vanity and self-delusion.

WORD SEARCH PUZZLE

Circle as many words as you can in the puzzle below.

Book	Computer	Beer
Desk	Phone	Actor
Movie	Train	Music
Paper	School	Grass

S R E T U P M O C O

W P H O N E R E E B

A M U S I C P Z S N

B T N R O T C A S K

B M R K S E D E A O

R F O A G O L B R O

E L G V I Z B O G B

P A N U I N E L W Q

A G T A B E T G D O

P S C H O O L N I T

Opinion Questionnaire 1: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

The CVD Risk Biochip System for Assessing Cardiac Risk

"Cardiovascular Disease" is any disease that affects the heart or the system of blood vessels leading to and from the heart. According to the American Heart Association, such diseases cause more deaths globally each year than any other disease (approximately 30% of all deaths). Also, the World Health Organisation has estimated that at least 20 million people survive heart attacks and strokes every year. Many of these survivors require constant clinical care. This results in a significant number of people with Cardiovascular Disease going through the healthcare system every year. In fact, it is estimated that the disease costs every EU citizen approximately €230 in healthcare per year. The disease also affects the lives of approximately 4.4 million EU citizens every year.

Recent research has demonstrated that high risk for developing Cardiovascular Disease begins in middle-age. In particular, this research has shown that both males and females with just one risk factor for Cardiovascular Disease in middle age have a strong chance of developing the disease in later life. Furthermore, such people have a much higher risk of death from Cardiovascular Disease and a shorter estimated survival time for the disease.

The Biomedical Diagnostics Institute (BDI) in Dublin is developing a diagnostic system that assesses a person's risk of getting Cardiovascular Disease. This system is being designed to be relatively simple to use in order to enable a quick and easy assessment of cardiac risk. By doing so, the BDI hopes to move cardiac risk assessment into General Practitioners' offices, ambulances and the home. These factors could reduce the amount of money spent by EU tax-payers on healthcare for Cardiovascular Disease every year.

How it Works

The system consists of two components; a “CVD Risk Biochip” and a “CVD Risk Biochip” reader. The “CVD Risk Biochip” is a small device that will detect the concentration levels of a number of different proteins in the blood. Taken together, the concentration levels of these proteins can indicate a person’s risk for developing future cardiac problems.

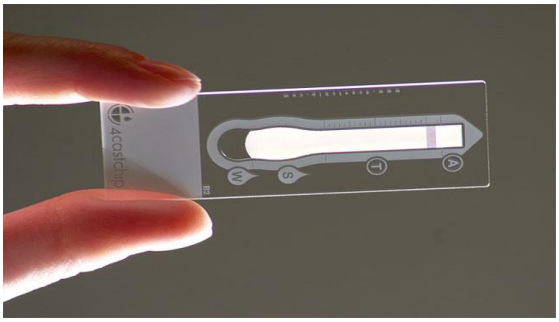

Figure 7: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

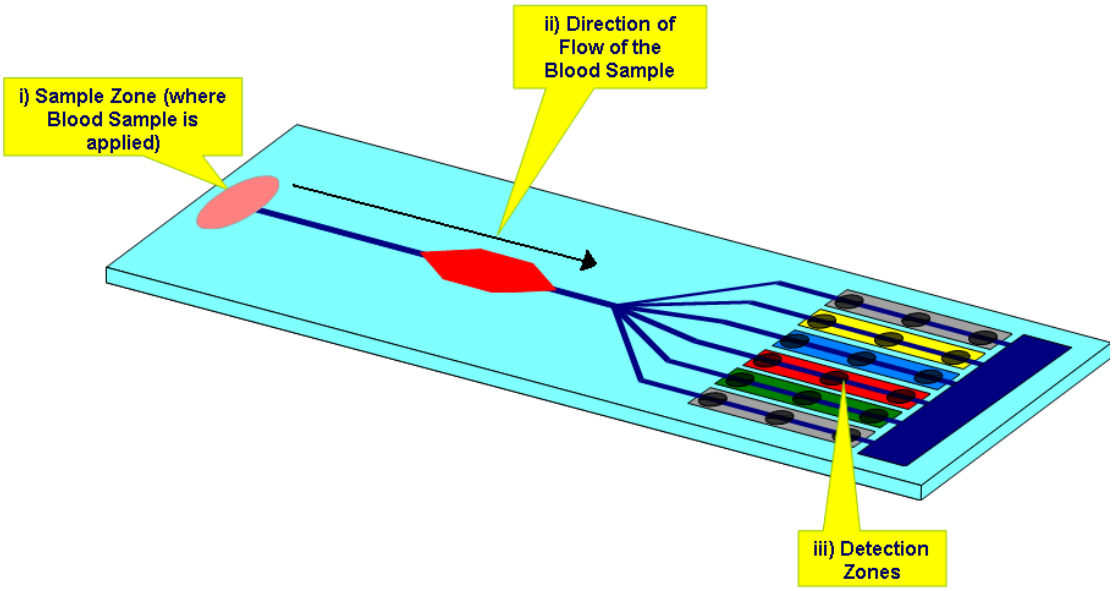

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

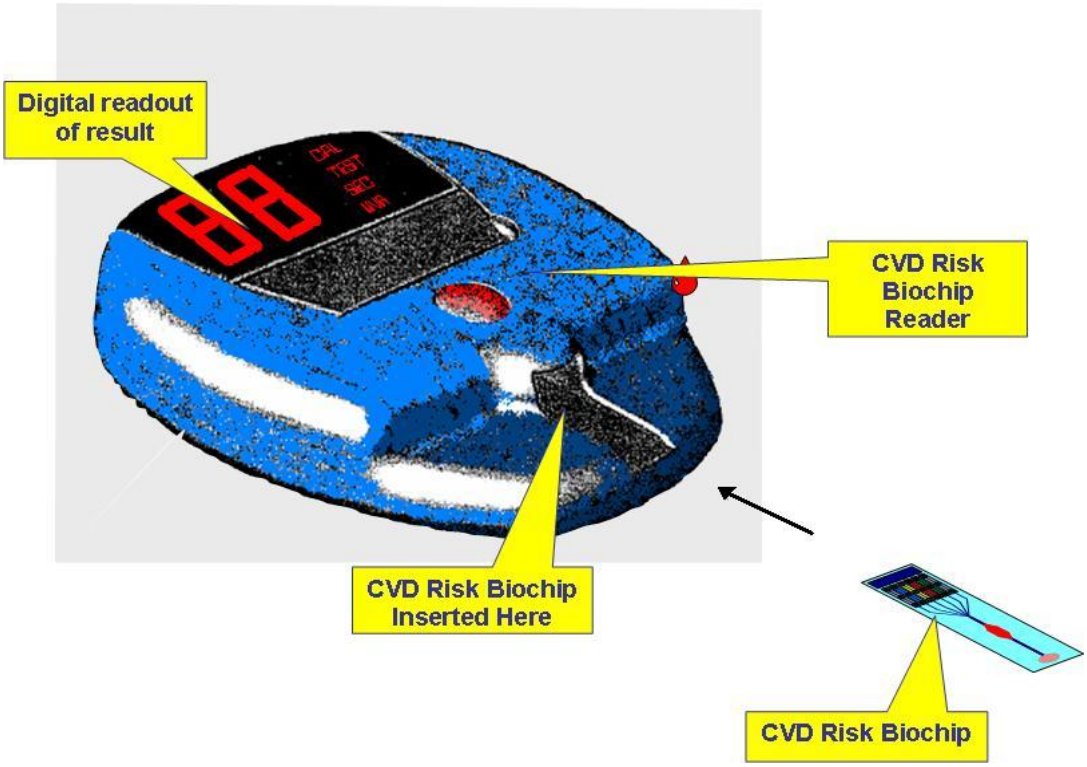

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. The CVD Risk Biochip is an unnecessary device.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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11. If my GP recommended that I use this device, it is highly likely that I would use it.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

12. The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

13. At this moment, I feel particularly motivated to use the CVD Risk Biochip.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

15. ***At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

Opinion Questionnaire 2: Diagnostic Technology

Diagnostic detection of risk factors for diseases like CVD is potentially becoming easier with technologies like the CVD Risk Biochip described earlier. Specifically, devices like the CVD Risk Biochip are being developed with a view to being used in the home as an indication for future risk of developing CVD. Try to clearly imagine what it might be like to use a technology like the CVD Risk Biochip yourself (for example, using the device in your own home) and answer the questions that follow. Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement. Please respond to them with your first, natural response.

1. ***The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***I would be skeptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

CVD Risk Biochip Pilot Study Sign-up Sheet (Optional)

The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details in the space below. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead. This information will not be used for any other purpose and will not be made available to any other third party.

Name	Phone Number	Address

Opinion Questionnaire 3: Literature Evaluation

Please recall the earlier essay that was presented in the Questionnaire Booklet concerning “The most important things that I have learned about human nature” and answer the questions that follow. Please respond to them with your first, natural response.

1. ***How much do you think you would like this person?***

   Not at all Somewhat Very much

   1 2 3 4 5 6 7 8 9

2. ***How intelligent do you believe this person to be?***

   Not at all Somewhat Very intelligent

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3. ***How knowledgeable do you believe this person to be?***

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6. ***From your perspective, how true do you think this person’s opinion is of the topic they discussed?***

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You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

F3: Uniqueness Prime/Self-Esteem Threat Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

In the following questionnaire booklet, you will be asked to complete several different questionnaires on various topics relating to personality and health. Please respond to them with your first, natural response.

We are looking for people's gut-level reactions to these questions.

LIFE EVENTS ASSESSMENT

The following task asks you to think about and describe an important life event. Since life events help shape personality, knowing about some personal experiences you have had will help us better understand your personality. Your honest responses to the following questions will be appreciated. Remember, all of your responses are completely anonymous.

PLEASE BRIEFLY THINK ABOUT AND DESCRIBE A TIME IN WHICH YOU FAILED TO LIVE UP TO ONE OF YOUR MOST IMPORTANT VALUES. THAT IS, DESCRIBE ONE OF YOUR GREATEST PERSONAL FAILURES.

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HOW DID THIS PERSONAL FAILURE MAKE YOU FEEL?

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The one thing that my education has made clear to me is that, although we humans have some things in common with other animals, human beings are truly unique. Although our bodies may be pretty similar to simpler species, the potential of the human mind and spirit go far beyond anything remotely similar to what is found in simple animals. First there are the obvious things: Humans have language and culture. We create works of art, music, and literature that enable us to live in an abstract world of the imagination -- something no other animal is capable of. Although simple animals may communicate with grunts and groans, and chimps can be taught basic sign language by humans, this is a far cry from the complex and inspiring works of human culture: Shakespeare, Beethoven, and Picasso, to name just a few. Unlike animals, humans live in a world of ideas and concepts, morals and values. We can even come to understand ourselves, as in the works of the great philosophers and psychologists. More importantly, humans have the capacity for love, generosity, and kindness ---- putting the welfare of others above themselves. We are not simple selfish creatures driven by hunger and lust, but complex individuals with a will of our own, capable of making choices, and creating our own destinies. Although we certainly have some things in common with simple animals, we humans are truly special and unique.

WORD SEARCH PUZZLE

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Desk	Phone	Actor
Movie	Train	Music
Paper	School	Grass

S R E T U P M O C O

W P H O N E R E E B

A M U S I C P Z S N

B T N R O T C A S K

B M R K S E D E A O

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A G T A B E T G D O

P S C H O O L N I T

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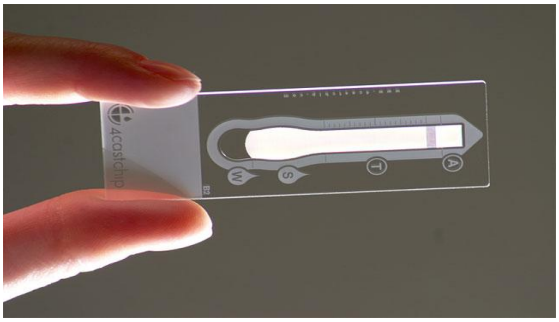

Figure 1: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

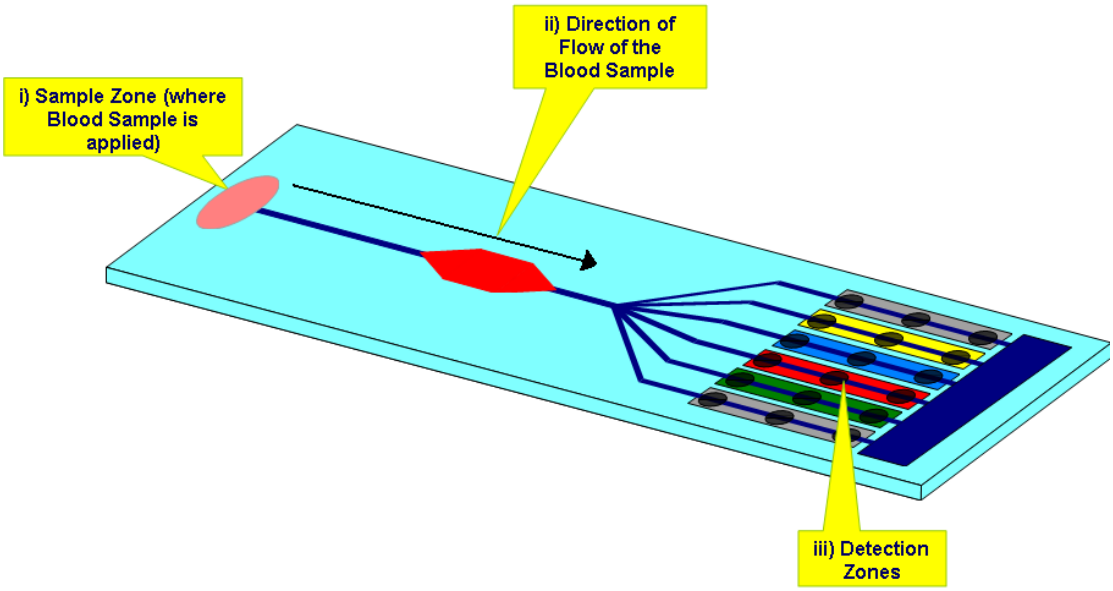

Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

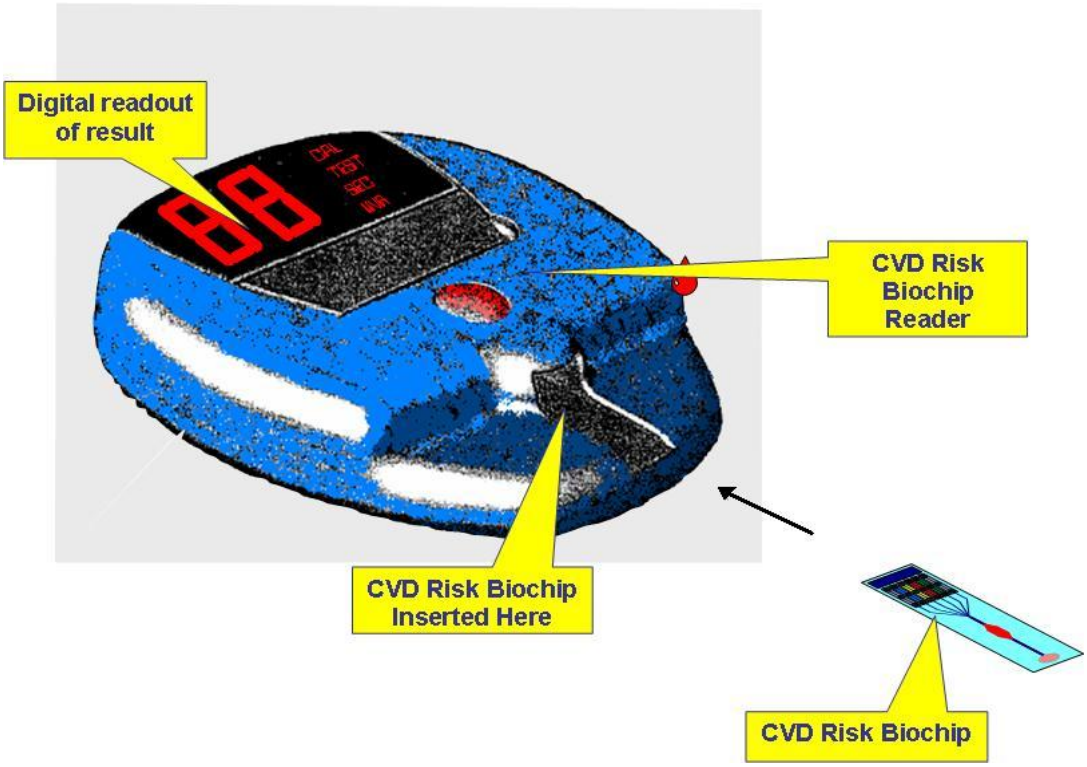

Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

11. ***If my GP recommended that I use this device, it is highly likely that I would use it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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12. ***The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

15. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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Opinion Questionnaire 2: Diagnostic Technology

Diagnostic detection of risk factors for diseases like CVD is potentially becoming easier with technologies like the CVD Risk Biochip described earlier. Specifically, devices like the CVD Risk Biochip are being developed with a view to being used in the home as an indication for future risk of developing CVD. Try to clearly imagine what it might be like to use a technology like the CVD Risk Biochip yourself (for example, using the device in your own home) and answer the questions that follow. Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement. Please respond to them with your first, natural response.

1. ***The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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3. ***Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body.***

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4. ***Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.***

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5. ***I would be skeptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
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CVD Risk Biochip Pilot Study Sign-up Sheet (Optional)

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Name	Phone Number	Address

Opinion Questionnaire 3: Literature Evaluation

Please recall the earlier essay that was presented in the Questionnaire Booklet concerning “The most important things that I have learned about human nature” and answer the questions that follow. Please respond to them with your first, natural response.

1. ***How much do you think you would like this person?***

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   Not at all Somewhat Very knowledgeable

   1 2 3 4 5 6 7 8 9

4. ***Is this person’s opinion well-informed?***

   Not at all Somewhat Very well-informed

   1 2 3 4 5 6 7 8 9

5. ***How much do you agree with this person’s opinion?***

   Not at all Somewhat Very much

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6. ***From your perspective, how true do you think this person’s opinion is of the topic they discussed?***

   Not at all Somewhat Very true

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Thank you!!!

F4: Uniqueness Prime/Self-Esteem Bolster Questionnaire

Please state your current age: ____

Please state your sex

Male ☐ Female ☐

In the following questionnaire booklet, you will be asked to complete several different questionnaires on various topics relating to personality and health. Please respond to them with your first, natural response.

We are looking for people's gut-level reactions to these questions.

LIFE EVENTS ASSESSMENT

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PLEASE BRIEFLY THINK ABOUT AND DESCRIBE A TIME IN WHICH YOU SUCCESSFULLY LIVED UP TO ONE OF YOUR MOST IMPORTANT VALUES. THAT IS, DESCRIBE ONE OF YOUR GREATEST PERSONAL SUCCESSES.

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HOW DID THIS PERSONAL SUCCESS MAKE YOU FEEL?

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On the following page you will receive an essay randomly selected from a pool of essays written by honour students at the University of Missouri-St. Louis. Please read the essay at your own pace. At the end of the study there will be a couple of questions about the essay. The questions will be looking for your first natural gut impression of the essay.

THE FOLLOWING SHORT ESSAY WAS A SENIOR HONORS STUDENT AT UNIVERSITY OF MISSOURI-ST. LOUIS. STUDENTS WERE ASKED TO WRITE ON THE TOPIC: THE MOST IMPORTANT THINGS I HAVE LEARNED ABOUT HUMAN NATURE.

The one thing that my education has made clear to me is that, although we humans have some things in common with other animals, human beings are truly unique. Although our bodies may be pretty similar to simpler species, the potential of the human mind and spirit go far beyond anything remotely similar to what is found in simple animals. First there are the obvious things: Humans have language and culture. We create works of art, music, and literature that enable us to live in an abstract world of the imagination -- something no other animal is capable of. Although simple animals may communicate with grunts and groans, and chimps can be taught basic sign language by humans, this is a far cry from the complex and inspiring works of human culture: Shakespeare, Beethoven, and Picasso, to name just a few. Unlike animals, humans live in a world of ideas and concepts, morals and values. We can even come to understand ourselves, as in the works of the great philosophers and psychologists. More importantly, humans have the capacity for love, generosity, and kindness ---- putting the welfare of others above themselves. We are not simple selfish creatures driven by hunger and lust, but complex individuals with a will of our own, capable of making choices, and creating our own destinies. Although we certainly have some things in common with simple animals, we humans are truly special and unique.

WORD SEARCH PUZZLE

Circle as many words as you can in the puzzle below.

Book	Computer	Beer
Desk	Phone	Actor
Movie	Train	Music
Paper	School	Grass

S R E T U P M O C O

W P H O N E R E E B

A M U S I C P Z S N

B T N R O T C A S K

B M R K S E D E A O

R F O A G O L B R O

E L G V I Z B O G B

P A N U I N E L W Q

A G T A B E T G D O

P S C H O O L N I T

Opinion Questionnaire 1: The "CVD Risk Biochip"

Please read the following short passage about a new diagnostic device called The "CVD Risk Biochip" and answer the questions below it.

The CVD Risk Biochip System for Assessing Cardiac Risk

"Cardiovascular Disease" is any disease that affects the heart or the system of blood vessels leading to and from the heart. According to the American Heart Association, such diseases cause more deaths globally each year than any other disease (approximately 30% of all deaths). Also, the World Health Organisation has estimated that at least 20 million people survive heart attacks and strokes every year. Many of these survivors require constant clinical care. This results in a significant number of people with Cardiovascular Disease going through the healthcare system every year. In fact, it is estimated that the disease costs every EU citizen approximately €230 in healthcare per year. The disease also affects the lives of approximately 4.4 million EU citizens every year.

Recent research has demonstrated that high risk for developing Cardiovascular Disease begins in middle-age. In particular, this research has shown that both males and females with just one risk factor for Cardiovascular Disease in middle age have a strong chance of developing the disease in later life. Furthermore, such people have a much higher risk of death from Cardiovascular Disease and a shorter estimated survival time for the disease.

The Biomedical Diagnostics Institute (BDI) in Dublin is developing a diagnostic system that assesses a person's risk of getting Cardiovascular Disease. This system is being designed to be relatively simple to use in order to enable a quick and easy assessment of cardiac risk. By doing so, the BDI hopes to move cardiac risk assessment into General Practitioners' offices, ambulances and the home. These factors could reduce the amount of money spent by EU tax-payers on healthcare for Cardiovascular Disease every year.

How it Works

The system consists of two components; a “CVD Risk Biochip” and a “CVD Risk Biochip” reader. The “CVD Risk Biochip” is a small device that will detect the concentration levels of a number of different proteins in the blood. Taken together, the concentration levels of these proteins can indicate a person’s risk for developing future cardiac problems.

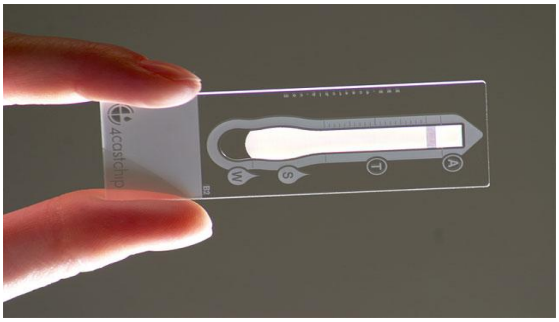


Figure 1: CVD Risk Biochip (approximate size)

The system works on a similar principal to the Blood Glucose Meters that diabetics use to measure the concentration levels of glucose in the blood. In the case of the CVD Risk Biochip, a pinprick of blood would be taken from the patient and would then be placed on to the sample zone of the CVD Risk Biochip. Figure 2 illustrates how the device could work. Tiny structures on the chip allow the pinprick of blood to flow from the sample zone across the surface of the chip (Figure 2ii). The blood flows along the chip until it reaches a number of detection zones (Figure 2iii). Each detection zone is capable of detecting the presence of a specific protein in the blood.

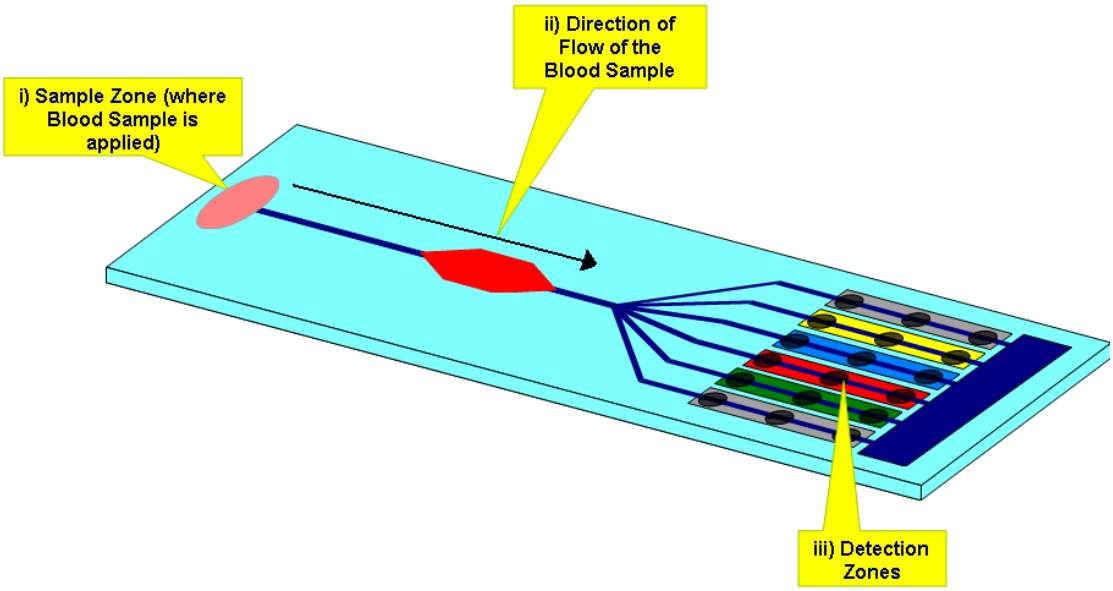


Figure 2: CVD Risk Biochip (Component Parts)

The chip is then inserted into the CVD Risk Biochip Reader to measure the concentration levels of the proteins of interest. Once inserted into the Reader, a certain amount of fluorescent light is emitted from each detection zone. The amount of light emitted from a detection zone indicates the concentration level of the appropriate protein that is present in the blood. The Reader measures the amount of fluorescent light coming from each of the detection zones on the CVD Risk Biochip and indicates these concentration levels in a display. When taken together, these concentration levels can show a person's risk for developing Cardiovascular Disease.

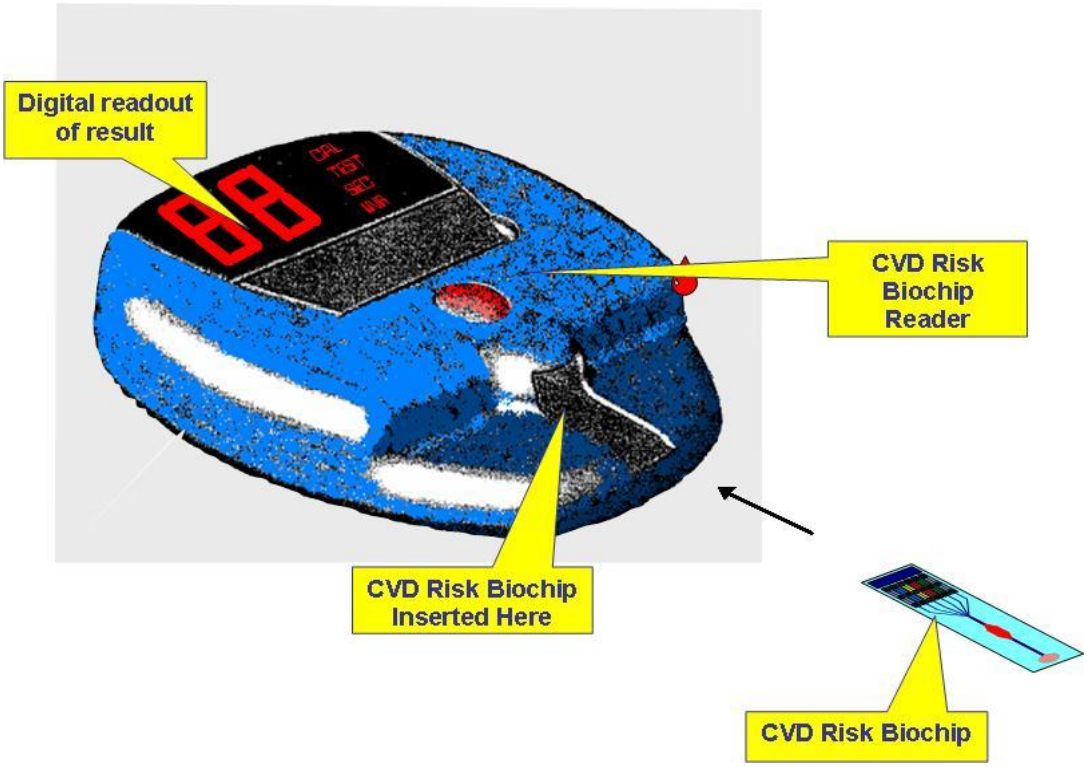


Figure 3: CVD Risk Biochip and Reader

Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement.

1. ***The CVD Risk Biochip is an exciting new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Diagnostic testing should be left to the professionals.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***The CVD Risk Biochip makes me feel empowered about my health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***The CVD Risk Biochip will only serve to frighten people about their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***The CVD Risk Biochip is a valuable new device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Moving diagnostic testing from hospital settings to the home is a great idea.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***The CVD Risk Biochip makes me feel anxious.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

8. ***The CVD Risk Biochip will encourage people to take a more active approach to their health.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

9. ***The CVD Risk Biochip is an unnecessary device.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

10. ***If I saw this device in a supermarket or pharmacy, it is highly likely that I would buy it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

11. ***If my GP recommended that I use this device, it is highly likely that I would use it.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

12. ***The CVD Risk Biochip sounds like it could be a useful device but I probably wouldn't use it myself.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

13. ***At this moment, I feel particularly motivated to use the CVD Risk Biochip.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

14. ***At this moment, the thought of using the CVD Risk Biochip is particularly unappealing.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

15. At this moment, the thought of using the CVD Risk Biochip makes me feel uncomfortable.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

Opinion Questionnaire 2: Diagnostic Technology

Diagnostic detection of risk factors for diseases like CVD is potentially becoming easier with technologies like the CVD Risk Biochip described earlier. Specifically, devices like the CVD Risk Biochip are being developed with a view to being used in the home as an indication for future risk of developing CVD. Try to clearly imagine what it might be like to use a technology like the CVD Risk Biochip yourself (for example, using the device in your own home) and answer the questions that follow. Please indicate how strongly you disagree or agree with each of the following statements by circling the appropriate number below the statement. Please respond to them with your first, natural response.

1. ***The risk factor information I receive from a diagnostic test like the CVD Risk Biochip cannot be easily related to my own bodily experiences.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

2. ***Using a technology like the CVD Risk Biochip to detect risk factors for a disease that I cannot feel with my body seems unreal to me.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

3. ***Risk factor results from diagnostic technologies like the CVD Risk Biochip are more important than my own sense of health and well-being that I experience from my body.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

4. ***Focusing on risk factor results from diagnostic technologies like the CVD Risk Biochip draws my attention away from my own personal experiences of my body.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

5. ***I would be skeptical about results from a device like the CVD Risk Biochip that reveal a measure of risk for developing CVD that I do not feel relate to my feelings of general health and well-being from my body.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

6. ***Thinking about risk factor results from diagnostic technologies like the CVD Risk Biochip makes me feel passive towards my body.***

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

7. ***Diagnostic technologies like the CVD Risk Biochip that focus on risk factors make me less reliant on my bodily feelings and sensations.***

Strongly Disagree	Somewhat Disagree		Somewhat Agree	Strongly Agree
1	2	3	4	5

CVD Risk Biochip Pilot Study Sign-up Sheet (Optional)

The CVD Risk Biochip is currently being finalised in the laboratory. However, once the chip is ready for the marketplace, the developers may require some people to test the device in a pilot investigation. If you would be interested in taking part in such a test of the device, please provide your contact details in the space below. These contact details will be kept in a secure location and would only be forwarded on to the CVD Risk Biochip developers should the pilot investigation go ahead. This information will not be used for any other purpose and will not be made available to any other third party.

Name	Phone Number	Address

Opinion Questionnaire 3: Literature Evaluation

Please recall the earlier essay that was presented in the Questionnaire Booklet concerning "The most important things that I have learned about human nature" and answer the questions that follow. Please respond to them with your first, natural response.

1. ***How much do you think you would like this person?***

   Not at all Somewhat Very much

   1 2 3 4 5 6 7 8 9

2. ***How intelligent do you believe this person to be?***

   Not at all Somewhat Very intelligent

   1 2 3 4 5 6 7 8 9

3. ***How knowledgeable do you believe this person to be?***

   Not at all Somewhat Very knowledgeable

   1 2 3 4 5 6 7 8 9

4. ***Is this person's opinion well-informed?***

   Not at all Somewhat Very well-informed

   1 2 3 4 5 6 7 8 9

5. ***How much do you agree with this person's opinion?***

   Not at all Somewhat Very much

   1 2 3 4 5 6 7 8 9

6. ***From your perspective, how true do you think this person's opinion is of the topic they discussed?***

   Not at all Somewhat Very true

   1 2 3 4 5 6 7 8 9

You have now reached the end of the questionnaire booklet. Please inform the principal investigator that you have finished and you will be provided with a debriefing sheet and given the opportunity to ask any questions that you may have about the study.

Thank you!!!

APPENDIX G: DEBRIEFING SHEETS

G1: Study 1 Debriefing Sheet

This research project is entitled “Psychosocial Aspects of Biomedical Diagnostics”. We are interested in finding out whether or not anxieties about death could have an impact on people’s use of a new device called the “CVD Risk Biochip”. As detailed in the questionnaire you have just completed, this new device is being developed as a quick and easy method of assessing a person’s risk for developing Cardiovascular Disease. Cardiovascular Disease is an illness where death is a very real consequence. As a result, thoughts about receiving a diagnosis of Cardiovascular Disease may trigger high levels of death anxiety in people who are given the option to use the CVD Risk Biochip. These people may avoid the use of this device in order to avoid the death anxiety that may come with its use.

In this research project, we are interested in whether or not anxieties about death could have an influence on people’s intention to use the CVD Risk Biochip (e.g. in the home or in a GP’s office). We are also interested in people’s attitudes towards this device when they encounter death anxiety. People are generally not aware of their anxieties about death and how they affect their everyday lives. Nonetheless, recent research has demonstrated that anxieties about death can prevent people from participating in cancer screening behaviours that are potentially beneficial to their health and well being. We hope to expand on this research by investigating if anxieties about death could be a barrier to using the CVD Risk Biochip in the home. The results of this study will hopefully identify if a pattern exists in screening for illnesses with a high mortality rate, whereby death anxiety acts as a barrier to participating in these behaviours. Identifying such a pattern would allow for medical professionals to take account of this barrier to screening behaviours in the future.

In order to test these effects of death anxiety, we have placed participants in this study in one of three groups. We have given the first group a questionnaire booklet containing two-open ended questions that ask them to write about what they think will happen to them when they die. We have given

the second group a questionnaire booklet containing two-open ended questions that ask them to write about what they think will happen to them when they have a heart attack. As a comparison to these two groups, we have given the third group a questionnaire booklet containing two-open ended questions that ask them to write about what they think will happen to them when they experience dental pain.

As previously mentioned, people are generally not aware of the effects that their anxieties about death can have on their everyday lives. Therefore, the next part of the questionnaire booklet contains a neutral distracting task (a reading comprehension task) that is designed to remove thoughts of death, heart attacks or dental pain from conscious awareness. With death, heart attack or dental pain concerns now outside of focal awareness, we asked participants about their attitudes and intentions to use the CVD Risk Biochip.

We predict that thoughts of death or having a heart attack will reduce people's desire to use the CVD Risk Biochip compared to thoughts of dental pain. We also predict that thoughts of death or having a heart attack will give people more negative attitudes towards the device than thoughts of dental pain. As a result, we expect to find significantly fewer people to express intentions to use the CVD Risk Biochip in the groups who we are asking to think about death or having a heart attack compared to the group who we are asking to think about dental pain. Similarly, we expect to find significantly more negative attitudes towards the device in the groups who we are asking to think about death or having a heart attack compared to the group who we are asking to think about dental pain.

Please note that we are only using the back page of the questionnaire booklet (where you were given the option to supply your contact details) as a way of measuring intentions to use the device. As a result, any contact details that you may have supplied on this sheet will not be used by any third party and will now be detached from the rest of the questionnaire booklet and torn up. Please also note that the full nature of this research had to be hidden from you from the outset of the study. This is because the study involves the

effects of death anxiety on attitudes and intentions. If you had known that the study involved the effects of death anxiety on your attitudes and intentions to use the CVD Risk Biochip, research suggests that you may have biased your responses. Many previous studies have used a similar method to this one in order to remove this bias.

The project is funded by a Science Foundation Ireland Centres for Science, Engineering & Technology grant, via the Biomedical Diagnostics Institute (BDI) in Dublin City University. If you have any further questions about the research project, please feel free to contact Mr. Simon Dunne, now or at a later stage on 01 7007796. The School of Nursing, via the “Healthy Living Centre” have recently established AKOS a “Centre for Psychological Health and Well Being”, which would provide support, should the need arise. Alternatively, if you wish to contact an independent person in relation to your concerns, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

G2: Study 2 Debriefing Sheet

This research project is entitled “Existential Concerns in Point-of-Care Testing”. We are interested in finding out whether or not anxieties about death could have an impact on people’s use of a new device called the “CVD Risk Biochip”. As detailed in the questionnaire you have just completed, this new device is being developed as a quick and easy method of assessing a person’s risk for developing Cardiovascular Disease. Cardiovascular Disease is an illness where death is a very real consequence. As a result, thoughts about receiving a diagnosis of Cardiovascular Disease may trigger high levels of death anxiety in people who are given the option to use the CVD Risk Biochip. These people may avoid the use of this device in order to avoid the death anxiety that may come with its use.

In this research project, we are interested in whether or not anxieties about death could have an influence on people’s intention to use the CVD Risk Biochip (e.g. in the home or in a GP’s office). We are also interested in people’s attitudes towards this device when they encounter death anxiety. People are generally not aware of their anxieties about death and how they affect their everyday lives. Nonetheless, recent research has demonstrated that anxieties about death can prevent people from participating in cancer screening behaviours that are potentially beneficial to their health and well being. We hope to expand on this research by investigating if anxieties about death could be a barrier to using the CVD Risk Biochip in the home. The results of this study will hopefully identify if a pattern exists in screening for illnesses with a high mortality rate, whereby death anxiety acts as a barrier to participating in these behaviours. Identifying such a pattern would allow for medical professionals to take account of this barrier to screening behaviours in the future.

In order to test these effects of death anxiety, we have placed participants in this study in one of three groups. We have given the first group a questionnaire booklet containing two-open ended questions that ask them to write about what they think will happen to them when they die. We have given the second group a questionnaire booklet containing two-open ended

questions that ask them to write about what they think will happen to them when they have a heart attack. As a comparison to these two groups, we have given the third group a questionnaire booklet containing two-open ended questions that ask them to write about what they think will happen to them when they experience dental pain.

As previously mentioned, people are generally not aware of the effects that their anxieties about death can have on their everyday lives. Therefore, the next part of the questionnaire booklet contains a neutral distracting task (a reading comprehension task) that is designed to remove thoughts of death, heart attacks or dental pain from conscious awareness. With death, heart attack or dental pain concerns now outside of focal awareness, we asked participants about their attitudes and intentions to use the CVD Risk Biochip.

We predict that thoughts of death or having a heart attack will reduce people's desire to use the CVD Risk Biochip compared to thoughts of dental pain. We also predict that thoughts of death or having a heart attack will give people more negative attitudes towards the device than thoughts of dental pain. As a result, we expect to find significantly fewer people to express intentions to use the CVD Risk Biochip in the groups who we are asking to think about death or having a heart attack compared to the group who we are asking to think about dental pain. Similarly, we expect to find significantly more negative attitudes towards the device in the groups who we are asking to think about death or having a heart attack compared to the group who we are asking to think about dental pain.

Please note that we are only using the back page of the questionnaire booklet (where you were given the option to supply your contact details) as a way of measuring intentions to use the device. As a result, any contact details that you may have supplied on this sheet will not be used by any third party and will now be detached from the rest of the questionnaire booklet and torn up. Please also note that the full nature of this research had to be hidden from you from the outset of the study. This is because the study involves the effects of death anxiety on attitudes and intentions. If you had known that the

study involved the effects of death anxiety on your attitudes and intentions to use the CVD Risk Biochip, research suggests that you may have biased your responses. Many previous studies have used a similar method to this one in order to remove this bias.

The project is funded by a Science Foundation Ireland Centres for Science, Engineering & Technology grant, via the Biomedical Diagnostics Institute (BDI) in Dublin City University and an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholarship. If you have any further questions about the research project, please feel free to contact Mr. Simon Dunne, now or at a later stage on 01 7007796. The School of Nursing, via the “Healthy Living Centre” have recently established AKOS a “Centre for Psychological Health and Well Being”, which would provide support, should the need arise. Alternatively, if you wish to contact an independent person in relation to your concerns, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

G3: Study 3 Debriefing Sheet

The study that you have just participated in is part of a research project entitled “Existential Concerns in Point-of-Care Testing”. This research project is chiefly interested in whether or not death-related issues like thinking about your own death or thinking about having a heart attack could act as a barrier to people’s participation in screening behaviours for Cardiovascular Disease.

Previous research in “Terror Management Theory” has demonstrated that people try to suppress death-related issues immediately after they are asked to think about them. In other words, death-related thoughts that are in people’s immediate conscious awareness are initially suppressed. In contrast, research has found that death-related thoughts that are just below conscious awareness are extremely well recalled by people. Conditions where death-related thoughts are thought to be “just below conscious awareness” include; (a) when a delay or distraction follows someone’s conscious thoughts concerning death and (b) when someone thinks about death when they are pre-occupied with other thoughts.

The purpose of the current study is to investigate if people are better able to recall death-related issues after they are asked to think about a death-related topic (in this case thoughts about having a heart attack) when they are pre-occupied with other thoughts or when they are asked to think about this death-related topic and subsequently distracted. Additionally, we are interested in whether or not people are better able to recall death-related issues after they are asked to think about this death-related topic and distracted or pre-occupied with other thoughts than when they are asked to think about the death-neutral alternative topic of dental pain and subsequently distracted or pre-occupied with other thoughts. In order to test these ideas, we have placed participants in our study into one of four groups.

Participants in the first two groups are given a measure of “preoccupation with other thoughts” and a death-related topic or death-neutral topic to think about. The first group are initially asked to memorise a number, which they are instructed to keep in their mind in order that they may easily recall it later.

This is a measure which is thought to provide a condition of pre-occupied thoughts for participants. They are then prompted to think about having a heart attack (the death-related topic) and given a task to perform that is thought to demonstrate the recall of death-related issues over non-death-related issues (the “word completion task”). Finally, participants in this group are prompted to recall the number they were asked to memorise. Similarly, participants in the second group are initially asked to memorise this number in the same way and are subsequently prompted to think about the death-neutral alternative topic of dental pain. These participants then complete the “word completion task” and are prompted to recall the number they were asked to memorise.

Participants in the third and fourth groups are distracted from a death-related topic or death-neutral topic after they are prompted to engage in it. Those participants in the third group are initially asked to think about having a heart attack (the death-related topic) and are then given a task to perform that is thought to provide a distraction from this topic (the “literature task”). They are then instructed to perform the “word completion task”. In a similar fashion, participants in the fourth group are initially asked to think about dental pain (the death-neutral topic) and are prompted to complete the “literature task”. Finally, these participants are instructed to perform the “word completion task”.

By comparing the results of the “word completion task” across the various groups described above, we hope to uncover whether or not participants from the different groups display differences in their recall of death-related words.

Please note that the full nature of this research had to be hidden from you from the outset of the study. This is because the study involves the effects of thoughts about death on subsequent recall of death-related words. If you had known that the study involved such a topic, research suggests that you may have biased your responses. Many previous studies have used a similar method to this one in order to remove this bias.

The project is funded by an Irish Research Council for the Humanities and Social Sciences Postgraduate Scholarship and a Science Foundation Ireland Centres for Science, Engineering & Technology grant, via the Biomedical Diagnostics Institute (BDI) in Dublin City University. If you have any further questions about or concerns arising from the research project, please feel free to contact Mr. Simon Dunne, now or at a later stage on 01 7007796. Alternatively, if you wish to contact an independent person in relation to your concerns, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000.

G4: Study 4 Debriefing Sheet

This research project is entitled “Existential Concerns in Point-of-Care Testing”. We are interested in finding out whether or not anxieties about death could have an impact on people’s gut-level responses towards the “CVD Risk Biochip”. As detailed in the questionnaire you have just completed, this device was planned as a quick and easy method of assessing a person’s risk for developing Cardiovascular Disease. Cardiovascular Disease is an illness where death is a very real consequence. As a result, thoughts about receiving a diagnosis of Cardiovascular Disease may trigger mortality concerns in people who are given the option to use the CVD Risk Biochip. These people may exhibit unfavourable responses towards this device in order to avoid the mortality concerns that may be associated with its use.

In this research project, we are interested in whether or not getting people to think about mortality-related concerns could have an influence on people’s intention to use the proposed CVD Risk Biochip (e.g. in the home or in a GP’s office). We are also interested in people’s attitudes towards the proposed device when they encounter these mortality concerns. People are generally not aware of their anxieties about their mortality and how they affect their everyday lives. Nonetheless, recent research has demonstrated that mortality concerns can prevent people from participating in cancer screening behaviours that are potentially beneficial to their health and well being. We hope to expand on this research by investigating if mortality concerns could be a barrier to using a device such as the CVD Risk Biochip in the home. The results of this study will hopefully identify if a pattern exists in screening for illnesses with a high mortality rate, whereby mortality concerns acts as a barrier to participating in these behaviours. Identifying such a pattern would allow for medical professionals to take account of such barriers to screening behaviours in the future.

We are also interested in two additional ideas with the current study. Firstly, it has been suggested that high self-esteem is a protective factor for people against mortality concerns, whereas low self-esteem makes people more vulnerable towards such concerns. Additionally, we are also interested in the

possibility that the device described here gives risk information that appears surreal or remote to people, thereby promoting diminished feelings of responsibility towards their personal health.

In order to test these ideas, we have placed participants in this study in one of four groups. Participants in the first two groups are initially asked to describe a time when they succeeded in living up to one of their most important values. This measure has been used in previous research as a way of boosting participants' self-esteem temporarily. After this is completed, participants in the first group are then given an essay to read that emphasises the similarity of humans to other animals. This measure has been used in previous research as a way of getting participants to think explicitly about mortality concerns (i.e. by getting them to think about how similar all humans are to other animals). In contrast to this measure, participants in the second group are given an essay to read that emphasises the uniqueness of humans as compared to other animals. This measure has been used in previous research to provide a comparison group to the first group, where participants are given a topic to think about that may serve to protect them from mortality concerns.

Participants in the third and fourth group are initially asked to describe a time when they failed in living up to one of their most important values. This measure has been used in previous research as a way of lowering participants' self-esteem temporarily. In a similar fashion to the first and second groups, participants in the third group then receive the essay that emphasises the similarity of humans to other animals and participants in the fourth group then receive the essay that emphasises the uniqueness of humans as compared to other animals.

As previously mentioned, people are generally not aware of the effects that mortality concerns can have on their everyday lives. Therefore, the next part of the questionnaire booklet contains a neutral distracting task (a word search task) that is designed to remove thoughts about the human similarity to other animals or the human uniqueness compared to other animals from conscious

awareness. With such concerns now outside of focal awareness, we ask participants about their attitudes and intentions to use the CVD Risk Biochip. Additionally, we included a questionnaire for participants to complete concerning the extent that they consider the risk information from the CVD Risk Biochip appears surreal or remote to them.

We predict that mortality concerns will reduce people's desire to use the proposed CVD Risk Biochip compared to the group asked to think about human uniqueness. We also predict that mortality concerns will give people more negative attitudes towards the device than thoughts of dental pain. As a result, we expect to find significantly fewer people to express intentions to use the proposed CVD Risk Biochip in the groups who we are asking to think about mortality concerns compared to the group who we are asking to think about human uniqueness. Similarly, we expect to find significantly more negative attitudes towards the device in the groups who we are asking to think about mortality concerns compared to the group who we are asking to think about human uniqueness. Additionally, we expect that participants in the third and fourth groups who have their self-esteem lowered to have more negative attitudes towards the device and lower intentions to use the device when compared to the first two groups who have had their self-esteem boosted. Finally, if it is the case that we find none of the above effects, we expect that the majority of participants will have considered the proposed risk information from the CVD Risk Biochip to be surreal or remote to them.

Please note that we are only using the page of the questionnaire booklet where you were given the option to supply your contact details as a way of measuring intentions to use the device. As a result, any contact details that you may have supplied on this sheet will not be used by any third party and will now be detached from the rest of the questionnaire booklet and torn up. Please also note that the full nature of this research had to be hidden from you from the outset of the study. This is because the study involves the effects of death anxiety on attitudes and intentions. If you had known that the study involved the effects of death anxiety on your attitudes and intentions to use the CVD Risk Biochip, research suggests that you may have biased your

responses. Many previous studies have used a similar method to this one in order to remove this bias.

The project is funded by a Science Foundation Ireland Centres for Science, Engineering & Technology grant, via the Biomedical Diagnostics Institute (BDI) in Dublin City University and an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholarship. If you have any further questions about the research project, please feel free to contact Mr. Simon Dunne, now or at a later stage on 01 7007796. The School of Nursing, via the “Healthy Living Centre” have recently established AKOS a “Centre for Psychological Health and Well Being”, which would provide support, should the need arise. Alternatively, if you wish to contact an independent person in relation to your concerns, please contact: The Secretary, Dublin City University Research Ethics Committee, c/o Office of the Vice-President for Research, Dublin City University, Dublin 9. Tel 01-7008000

APPENDIX H: LEAFLETS FOR RECRUITING PARTICIPANTS

H1: Leaflets for Study 2

SIMON DUNNE
DCU SCHOOL OF
NURSING

DCU

Are you between 40-55 years of age and have never experienced a major heart-related event (e.g. a heart attack)?

If so, Mr Simon Dunne from DCU School of Nursing invites you to take part in a voluntary study on attitudes towards health and better ways of knowing about your health.

A study on attitudes to health and better ways of knowing about your health

DCU

Collins Avenue
Glasnevin
Dublin 9

Phone: 01 7007796
E-mail: simon.dunne2@mail.dcu.ie

What does this study involve?

You are being asked to participate in a research study relating to aspects of health and better ways of knowing about your health.

You are eligible to take part if you are between 40-55 years of age and have not had a major heart related event (e.g. a heart attack). If you agree to take part in this study, you will be asked to complete a questionnaire. This questionnaire contains four sections of questions and should take no more than 30 minutes to complete. The questionnaire asks you to give your opinions on various topics, including aspects of health and healthcare.

Who is conducting this research?

Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by a Science Foundation Ireland grant and has been approved by the Dublin City University

Will anyone else see my answers?

Absolutely not. If you agree to take part in this study, all information collected will be kept strictly confidential. The form that you sign to give your consent to participate in the study will be kept in a secure location that is separate from where the completed questionnaire itself will be stored. All of the completed questionnaires will be kept for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne.

What if the questions make me feel uncomfortable?

Your participation in this study is entirely voluntary. If any aspect of the study makes you feel unduly uncomfortable or distressed at any stage, you may withdraw from the study without prejudice. Additionally, you may withdraw to participate at any time and without giving any reasons for your withdrawal.

Your participation matters

The information that will be obtained from the study should greatly benefit the community by informing medical practitioners about attitudes towards health and healthcare methods.

The research will form the basis of reports, academic publications, conference papers and other scientific publications.

Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne, at the details provided

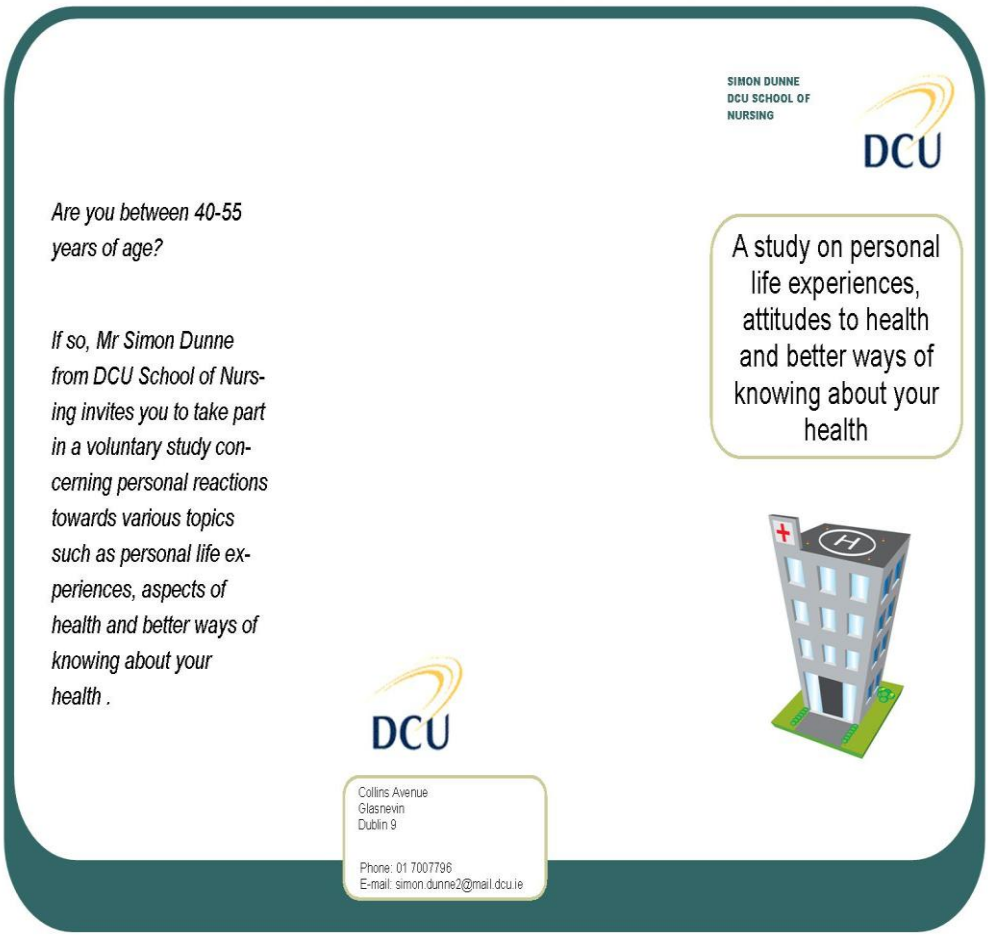
SIMON DUNNE
DCU SCHOOL OF NURSING

Collins Avenue
Glasnevin
Dublin 9

Phone: 01 7007796

E-mail: simon.dunne2@mail.dcu.ie

H2: Leaflets for Study 4



What does this study involve?

You are being asked to participate in a research study concerning personal reactions towards various topics such as personal life experiences, aspects of health and better ways of knowing about your health

You are eligible to take part if you are between 40-55 years of age. If you agree to take part in this study, you will be asked to complete a questionnaire. This questionnaire contains five sections of questions and should take no more than 30 minutes to complete. The questionnaire asks you to give an account of a life experience you may have had and to give your opinions on various topics, such as aspects of health and healthcare.

Who is conducting this research?

Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by a Science Foundation Ireland grant and an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholar-

Dubin City University Research Ethics Committee.

Will anyone else see my answers?

Absolutely not. If you agree to take part in this study, all information collected will be kept strictly confidential. The form that you sign to give your consent to participate in the study will be kept in a secure location that is separate from where the completed questionnaire itself will be stored. All of the completed questionnaires will be kept for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne.

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The information that will be obtained from the study should greatly benefit the community by informing medical practitioners about attitudes towards health and healthcare methods.

The research will form the basis of reports, academic publications, conference papers and other scientific publications.

Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne, at the details provided

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APPENDIX I: E-MAIL AND WORD ATTACHMENT CONTENT FOR RECRUITING STUDY 4 PARTICIPANTS

I1: E-mail Content for Recruiting Study 4 Participants

Dear Sir/Madam,

I would like to invite you to participate in a voluntary research study on personal life experiences, attitudes to health and better ways of knowing about your health. If you agree to take part in the study you will be asked to complete a questionnaire, which should take no longer than 30 minutes to complete. The questionnaire asks you to give your account of a life experience you may have had and to give your opinions on various topics, such as aspects of health and healthcare.

You are eligible to take part in the study if you are between 40-55 years of age. Further information on the study is contained in the corresponding word attachment.

If you are interested in taking part in this study, please reply to this e-mail and I will arrange a suitable time and convenient location for you to complete the questionnaire booklet.

Thank you for your time and consideration

Kind Regards

Simon Dunne
DCU School of Nursing Post-Graduate
Phone: 01 7007796

This research is funded by an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholarship and a Science Foundation Ireland Centres for Science, Engineering & Technology grant, via the Biomedical Diagnostics Institute (BDI) in Dublin City University.

I2: Word Attachment Content for Recruiting Study 4 Participants

You are being asked to participate in a research study concerning personal reactions towards various topics such as personal life experiences, aspects of health and better ways of knowing about your health.

You are eligible to take part if you are between 40-55 years of age. If you agree to take part in this study, you will be asked to complete a questionnaire. This questionnaire contains five sections of questions and should take no more than 30 minutes to complete. The questionnaire asks you to give an account of a life experience you may have had and to give your opinions on various topics, such as aspects of health and healthcare.

Mr. Simon Dunne is carrying out this study in the Dublin City University School of Nursing, with assistance from Dr. Pamela Gallagher and Dr. Anne Matthews. The study is being funded by a Science Foundation Ireland grant and an Irish Research Council for the Humanities and Social Sciences Post-Graduate Scholarship and has been approved by the Dubin City University Research Ethics Committee.

If you agree to take part in this study, all information collected will be kept strictly confidential. The form that you sign to give your consent to participate in the study will be kept in a secure location that is separate from where the completed questionnaire itself will be stored. All of the completed questionnaires will be kept for a minimum of five years. After this time they will be shredded and disposed of by Mr. Simon Dunne.

Your participation in this study is entirely voluntary. If any aspect of the study makes you feel unduly uncomfortable or distressed at any stage, you may withdraw from the study without prejudice. Additionally, you may withdraw to participate at any time and without giving any reasons for your withdrawal. The information that will be obtained from the study should greatly benefit the community by informing medical practitioners about attitudes towards health and healthcare methods.

The research will form the basis of reports, academic publications, conference papers and other scientific publications. Should you require any further information on the study, or if you have any concerns about any aspect of it at a later stage, please do not hesitate to contact the principal investigator, Mr. Simon Dunne, at the details provided in the corresponding e-mail.