Dual Information Processing of Cardiovascular Disease Risk Perception: An Examination of the Extended Parallel Process Model

A thesis submitted to
The University of Dublin, Trinity College
for the degree of
Doctor of Philosophy

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Declaration

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work.

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Signed: ____________________________

Sinéad Moylett

Date: ___/___/___
Summary

The overall objective of this thesis was to examine dual information processing of CVD risk communications through empirical manipulations of both information processing modes (cognitive and affective), and to examine the effect of such on risk appraisals for CVD and efficacy appraisals for the associated health behaviours. The thesis evolved into an examination of the Extended Parallel Process Model (EPPM; Witte, 1992, 1994) for communicating about CVD among Irish samples.

Chapter 2 presented a narrative review of the most relevant literature from dual processing theories of risk and decision-making. One of the main outcomes of the review was the lack of consideration given to the role of affect, and few previous investigations could be identified that have given equal consideration to both affective and cognitive processes in dual information processing of health communications. In trying to better understand the exact processes of “how” both information processing modes influence threat and efficacy appraisals for health threats and their associated health behaviours, no previous research has assessed both incidental and integral manipulations of information processing for CVD. In line with this, it was noted that there was a lack of research examining CVD in comparisons to other diseases (e.g., cancer).

Chapter 3 presents the method and results of an equal examination of dual information processing for CVD risks and the associated health behaviours within health communications, utilising an incidental manipulation. The study utilised a novel combination of images and word search puzzles to prime both affective and cognitive information processing modes, and to examine the potential impact of such on CVD risk perception. The results of the study did not support the manipulation. Additional statistical analyses (e.g., EFA) were conducted and suggested a slight theoretical shift
for future studies, with more of a focus on integral information processing for health communications.

Initially, chapter 4 presented a review of the EPPM for CVD and the associated health behaviours. The objective of study 2 was an experimental test of EPPM-based communications about CVD and the associated health behaviours. Given the lack of overall effects from the EPPM-based CVD messages and the inconsistent results for threat, study 2 provided little evidence to support the use of the EPPM. However, the study suffered from heavily skewed data and sampled a young population. Future investigations aimed to conduct a more focused examination of EPPM-based CVD risk messages among an older population (60+ years).

Chapters 5 and 6 discussed the mixed method approach of study 3. Chapter 5 presented a quantitative examination of six EPPM-based threat-to-efficacy ratios in CVD health messages. Part 1 of study 3 provided little evidence to support the use of the EPPM among older individuals. Due to these results, a think aloud methodology was used in part 2 to allow for a more in-depth investigation (Chapter 6). The qualitative findings highlighted a few important considerations; varying levels of threat appraisals for different CVD manifestations and the considerable role of comparative perceptions were found to impact on the effectiveness of the current EPPM-based CVD risk communications.

Chapter 7 is a discussion of the results and findings from all three studies. Overall, there was a lack of evidence found to support the EPPM, suggesting that the theory might not be the most suitable model for developing CVD risk communications. A number of key findings should be noted: the considerable role of comparative examples for threat and efficacy appraisals, misleading levels of health literacy, and varying threat perceptions for different CVD manifestations.
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## Abbreviations

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<tr>
<td>ANEW</td>
<td>Affective Norms for English Words</td>
</tr>
<tr>
<td>BIS</td>
<td>Behavioural Inhibition System</td>
</tr>
<tr>
<td>CEST</td>
<td>Cognitive-Experiential Self-Theory</td>
</tr>
<tr>
<td>CHD</td>
<td>Coronary Heart Disease</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>DCU</td>
<td>Dublin City University</td>
</tr>
<tr>
<td>EAT</td>
<td>Edinburgh Associative Thesaurus</td>
</tr>
<tr>
<td>EFA</td>
<td>Exploratory Factor Analysis</td>
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<tr>
<td>EnRG</td>
<td>Environmental Research framework for weight Gain prevention</td>
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<tr>
<td>EPPM</td>
<td>Extended Parallel Process Model</td>
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<tr>
<td>HBM</td>
<td>Health Belief Model</td>
</tr>
<tr>
<td>HPV</td>
<td>Human Papillomavirus</td>
</tr>
<tr>
<td>IAPS</td>
<td>International Affective Picture System</td>
</tr>
<tr>
<td>IMPACT</td>
<td>The IMPACT mortality model is a cell-based epidemiology model</td>
</tr>
<tr>
<td>KMO</td>
<td>Kaiser-Meyer-Olkin</td>
</tr>
<tr>
<td>MI</td>
<td>Myocardial Infarction</td>
</tr>
<tr>
<td>MRC</td>
<td>Medical Research Council</td>
</tr>
<tr>
<td>NHS</td>
<td>National Health Service (UK)</td>
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<tr>
<td>NFA</td>
<td>Need for Affect</td>
</tr>
<tr>
<td>NFC</td>
<td>Need for Cognition</td>
</tr>
<tr>
<td>PANAS-X</td>
<td>Positive and Negative Affect Schedule-Expanded Form</td>
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<tr>
<td>PCA</td>
<td>Principal Component Analysis</td>
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<tr>
<td>PMT</td>
<td>Protection Motivation Theory</td>
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<tr>
<td>RaF</td>
<td>‘Risk-as-Feelings’ Hypothesis</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>RBD</td>
<td>Risk Behaviour Diagnosis Scale</td>
</tr>
<tr>
<td>REI-40</td>
<td>Rational-Experiential Inventory (40 items)</td>
</tr>
<tr>
<td>RISP</td>
<td>Risk Information Seeking and Processing Model</td>
</tr>
<tr>
<td>RPQ</td>
<td>Risk Perception Questionnaire (Study 1)</td>
</tr>
<tr>
<td>SRMI</td>
<td>Self-Regulation Model of Illness</td>
</tr>
<tr>
<td>STD/STI</td>
<td>Sexual Transmitted Disease/Sexual Transmitted Illness</td>
</tr>
<tr>
<td>SUN2012</td>
<td>Database of environmental scenes, places and objects</td>
</tr>
<tr>
<td>TCD</td>
<td>Trinity College Dublin</td>
</tr>
<tr>
<td>TILDA</td>
<td>The Irish Longitudinal Study of Aging</td>
</tr>
<tr>
<td>TPB</td>
<td>Theory of Planned Behaviour</td>
</tr>
<tr>
<td>TRA</td>
<td>Theory of Reasoned Action</td>
</tr>
<tr>
<td>UCD</td>
<td>University College Dublin</td>
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<tr>
<td>WHO</td>
<td>World Health Organisation</td>
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Chapter 1: General Introduction

In order to give context to the constructs examined in this thesis, the following chapter presents a brief discussion of the overall rates of cardiovascular diseases (CVD) within Ireland. Additionally, consideration is paid to the effectiveness of primary prevention for reducing the rates of CVD, and along with such the risk factors and health behaviours associated with CVD are included. Lastly, topics relating to health communication are considered.

1.1 Cardiovascular Disease

CVD, which include diseases of the heart (e.g., ischaemic heart disease or coronary artery disease), vascular diseases of the brain (e.g., cerebrovascular disease or stroke) and diseases of blood vessels (e.g., hypertension), are the leading cause of death and disability in the world (Mendis, Puska, & Norrving, 2011; WHO, 2016). CVD cause the most deaths (17.5 million people annually) out of all those (38 million people annually) attributed to non-communicable diseases (NCDs; WHO, 2015). Variations in the rates of CVD have been noted across the world, with high-income countries experiencing decreases over the past two decades, however low-incomes countries have seen huge increases (Neylon et al., 2013).

Regional variations can be seen across Europe for rates of CVD and cardiovascular mortality (Eurostat, 2009; Muller-Nordhorn, Rossnagel, Mey, & Willich, 2004; Sans, Kesteloot, & Kromhout, 1997), with higher rates in eastern versus western European nations, and the lowest rates among southern European nations (Muller-Nordhorn, Binting, Roll, & Willich, 2008). Furthermore, these disparities change considerably when CVD is broken down into more specific CVD manifestations (e.g., ischaemic heart disease versus cerebrovascular diseases; Muller-Nordhorn et al.,
In 2012, the European Society of Cardiology estimated the potential cost of CVD to the European economy at almost €196 billion a year. Of this total cost of CVD, around 54% (≈€106 billion) is attributed to health care costs, 24% (≈€47 billion) due to productivity losses and 22% (≈€43 billion) due to the informal care of people with CVD (Nichols et al., 2012).

Within an Irish context, CVD are the most common cause of death in Ireland with approximately 10,000 people dying each year from CVD (McGee, 2010). In 2000, the Republic of Ireland implemented a major CVD prevention strategy entitled ‘Building Healthier Hearts’ (Building Healthier Hearts: The Report of the Cardiovascular Health Strategy Group, 1999), that was further updated in 2010 (McGee, 2010), with focuses on improving pre-hospital, hospital and primary care, as well as risk factor reductions among the population. Similar to worldwide trends for high-incomes countries (Aspelund et al., 2010; Finegold, Asaria, & Francis, 2013; Roger, 2007; Young, Capewell, Ford, & Critchley, 2010), Ireland has seen declines in CVD deaths and mortality rates since a peak in the mid-1980s through to the mid-2000s (Bennett, Hughes, Jennings, Kee, & Shelley, 2013; Bennett et al., 2006; O'Hara, Bennett, O'Flaherty, & Jennings, 2008; O'Keeffe et al., 2013).

Despite the reductions, for over two decades Ireland has held one of the top three positions among all EU-15 countries for male and female age standardised (all ages) coronary heart disease (CHD) mortality (O'Hara et al., 2008). The rates for premature deaths due to CVD in Ireland are still above the average for the EU member countries before 2004 (Foundation, 2016) and CHD is still the main cause of mortality in Ireland (Kabir, Bennett, Critchley, & Capewell, 2007).
1.1.1 Primary prevention

In the attempts to identify the key variables influencing the rates of CVD, a variety of policy models have become popular within the literature (e.g., IMPACT, CHD Policy Model, PREVENT, Global Burden of Disease; Unal, Capewell, & Critchley, 2006). Using the data from population-level, longitudinal studies of CVD and health in general (e.g., British Regional Heart Study, the Whitehall studies; Lennon et al., 2015; Marmot, & Brunner, 2005), these epidemiological models seek to establish how much of the changes in CVD rates can be attributed to the influence of population-level risk factors and of evidence-based treatments and/or interventions (Bajekal et al., 2012).

1.1.1.1 IMPACT models.

In particular, the IMPACT model (Capewell, Morrison, & McMurray, 1999) has become popular, due to its ability to consider a wide range of population risk factors as well as treatments and time trends on large sets of patient data. Developed in 1996 based on CHD, the IMPACT mortality model is a cell-based epidemiology model that accumulates information from primary and/or secondary sources about patient numbers, treatments, risk factors and mortality rates, and can therefore be used to make estimates about the among of mortality decline that can be achieved over time from treatments and/or risk factor reductions (Unal et al., 2006; Unal, Critchley, Fidan, & Capewell, 2005). Weinstein et al. (2003) has succinctly described the IMPACT model as "a logical mathematical framework that permits the integration of facts and values to produce outcomes of interest to clinicians and decision makers".

In terms of CVD, IMPACT models can take into account the population-level prevalence of subcategories of CVD and trends in major cardiovascular risk factors (smoking, cholesterol, blood pressure, obesity, diabetes, physical activity), amount of
medical and surgical treatments, and how effective both treatments and risk factor reductions are (Bennett et al., 2006). Investigations utilising the IMPACT model have been completed across an array of countries to examine the possible key variables influencing CVD mortality rates, deaths prevented or postponed and life-years gained (Unal et al., 2006).

From Irish data, it has been noted that similar to trends around the world, CHD mortality peaked in the mid-1980s. This was followed by a decrease up until 1998, which has exceeded that of other nations such as the UK and Finland (O'Hara et al., 2008). Reductions of 68% for men and 69% for women in CHD mortality (resulting in 6,450 fewer deaths) in the Republic of Ireland were found from 1985 and 2006 with narrowing gender gaps for both younger and older age groups (Kabir et al., 2013). Of the deaths prevented, again through analysis using the IMPACT model, the study attributed ≈40% of such to improvements in the uptake of treatments and ≈48% to improvements in risk factor levels among the population.

Due to criticisms in the literature of population-based models about output plausibility (face validity), predictive validity (of future events) and the greater use of such models for decision-making in policy and resource allocation (Briggs, Wolstenholme, Blakely, & Scarborough, 2016; Critchley & Capewell, 2002; Kopec et al., 2010), calls have been made for more sophisticated models, particularly in terms of the outcome measure used. A number of CVD models have been highlighted as being overly reliant on mortality as an outcome (Critchley & Capewell, 2002). Therefore, recent research has begun to consider outcomes such as life-years gained, cost-effectiveness of treatments/interventions and projections into the future of CVD rates if similar past trends continued.
For the Republic of Ireland, Kabir, Bennett, Shelley, et al. (2007) found through the IMPACT CHD mortality model that considerably more life-years-gained could be attributed to risk factor reductions (32,705) than to treatments (14,505). In a similar examination of reductions in cardiovascular risk factors, Kabir and colleagues (2007) also found that if the reduction targets for CHD risk factors set out in The Irish Health Strategy “Shaping a Healthier Future” (Department of Health, 2001) could be met by 2010 then the expected number of deaths due to CHD would be almost halved. Unfortunately, the targets were not met. Similar projections with risk factor reductions accounting for more than cardiology treatments have been made for life-years gained in England and Wales between 1981 and 2000 (Unal et al., 2005), in Scotland between 1975 and 1994 (Critchley, Capewell, & Unal, 2003) and the US between 1980 and 2000 (Capewell et al., 2009). Irrespective of the outcome measure, the vast majority of such models have come out with results in favour of primary prevention, over secondary, for significant reductions to the rates and burden of CVD.

1.1.2 CVD risk factors

1.1.2.1 Behavioural cardiology

Due to the results of such IMPACT models based on CHD and CVD rates, and the ever increasing demands on global healthcare services because of an growing ageing population within developed countries (WHO, 2015), those within sectors for healthcare policy and guidelines are calling for greater consideration of associated risk factors and what can be done to change them (Briggs et al., 2016). The NHS in England in 2014 called for a “radical upgrade in prevention and public health” (NHS, 2014). Additionally, within the area of cardiology, a new discipline has been recognised, that of behavioural cardiology (Das & O'Keefe, 2008; Katz & Wajngarten, 2015; Pickering, Clemow, Davidson, & Gerin, 2003; Rozanski, 2014). Behavioural cardiology places an
emphasis on both lifestyle and psychosocial factors, along with biological ones, and how they can impact CVD. As the global rates of CVD increased in the early 1980s despite advances in medical treatment, greater consideration was given to the impact that psychosocial risk factors can have on CVD (Pickering et al., 2003; Rozanski, 2014). Growing from the discipline of behavioural medicine, behavioural cardiology seeks to elucidate a number of areas, such as the influence of psychosocial risk factors on the rates of CVD, the relationship between mental and physical health for CVD, and what psychological and behavioural aspects influence patient levels of adherence to medical recommendations (Katz & Wajngarten, 2015; Rozanski, 2014).

Within healthcare, it is being accepted that behaviours have a role to play in the occurrence and course of diseases (Graves & Miller, 2003; Millar & Millar, 1993; Rozanski, 2014; Rozanski, Blumenthal, Davidson, Saab, & Kubzansky, 2005). There are slight differences between authors in terms of which behaviours they deem most important and the level of impact they have on specific risk factors. Based on an analysis of epidemiological data, Rozanski (2014) recently presented five broad divisions, which include a number of subcategories, for CHD behavioural risk factors that should be considered within the field of behavioural cardiology (see Table 1.1).

Along with the more classic and well-established risk factors of smoking, diet, obesity and stress (Mendis et al., 2011; Oliveira, Avezum, & Roever, 2015), the author highlighted the need to consider more psychological and emotion based risk factors such as anxiety, pessimism and poor social support, as well their associated cognitive components, e.g., the individual’s own perception of stress and their thoughts towards a sense of purpose. Results can be seen throughout the literature where changes to the classic risk factors and other less established lifestyle factors, such as diet, exercise, smoking cessation and relaxation training, can positively impact short and long-term
biomedical measures, e.g., cholesterol, plasma triglycerides, cardiac reactivity and premature ventricular contractions (Benson, Alexander, & Feldman, 1975; Haskell et al., 1994; Watts et al., 1992).

Table 1.1

Rozanski’s (2014) five broad divisions for CHD behavioural risk factors

<table>
<thead>
<tr>
<th>Behavioural Risk Factors</th>
<th>3. Chronic Stressors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Physical Health Behaviours</td>
<td>a) Situational stressors</td>
</tr>
<tr>
<td>a) Physical inactivity</td>
<td>• Work stress</td>
</tr>
<tr>
<td>b) Poor diet and obesity</td>
<td>• Martial stress</td>
</tr>
<tr>
<td>c) Smoking</td>
<td>• Social stressors</td>
</tr>
<tr>
<td>d) Poor or inadequate sleep</td>
<td>• Caregiver strain</td>
</tr>
<tr>
<td>e) Inadequate rest and relaxation</td>
<td>2. Negative Emotions and Mental Mind-sets</td>
</tr>
<tr>
<td>2. Negative Emotions and Mental Mind-sets</td>
<td>a) Depressive symptoms</td>
</tr>
<tr>
<td>a) Depressive symptoms</td>
<td>• Childhood and adult abuse</td>
</tr>
<tr>
<td>b) Anxiety</td>
<td>• Medical illness</td>
</tr>
<tr>
<td>c) Pessimism</td>
<td>b) Perceived stress</td>
</tr>
<tr>
<td>d) Anger and hostility</td>
<td>4. Social Isolation and Poor Social Support</td>
</tr>
<tr>
<td>5. Lack of Sense of Purpose</td>
<td></td>
</tr>
</tbody>
</table>


In line with such findings and similar to the arguments of Rozanski (2014) above, other authors have also emphasised the role of lifestyle and emotional factors for the occurrence and treatment of CVD for a number of decades (Graves & Miller, 2003; Millar & Millar, 1993; Rozanski et al., 2005). With recognising the importance of these emotional and behavioural factors, and the premise that they are amenable to change (Berra, 2010; Fine, Philogene, Gramling, Coups, & Sinha, 2004), efforts are being directed towards identifying the exact mechanisms for their influence on health behaviours and subsequently, health outcomes (e.g., CVD; Heitman, 2004; Klein & Stefanek, 2007; Millar & Millar, 1993). Bellg (2003) examined the key components needed for the development of new behaviours and maintenance of such for preventive cardiology. The author identified general factors that impact all adherence, and then
specific factors that are important for lifestyle adherence. In particular relevance to this thesis, communication, health beliefs and literacy are identified as key components to incentivising and maintaining changes in lifestyle behaviours. Furthermore as suggested by Katz and Wajngarten (2015), the issues of health communication and patient education are central constructs within many health behaviour change theories, e.g., Health Belief Model (HBM; Janz, & Becker, 1984), Stages of Change (Prochaska, Prochaska, & Levesque, 2001).

1.2 Health Communication

Effective communication of health information (e.g., disease, risks, associated health behaviours) is a key component to any public health protection strategy; however, it is a complicated and challenging process. In current times, the public are no longer relying only on the medical community for information about health risks (e.g., over-the-counter risk screening tests, online tools for estimating personal risk, abundance of information about risk factors on the Internet) and health risk information is being received in various media forms and environments where the appropriate support may not be available (Fox, 2011; Rus & Cameron, 2016). Therefore, there is a growing need to better understand the psychological effects of health information and the factors that influence how health information is processed. Investigations have shown that in spite of numerous efforts to communicate the risks of CVD and to educate about heart healthy lifestyles, understanding of CVD and the associated health behaviours is generally poor (Green, Grant, Hill, Brizzolara, & Belmont, 2003; Lambrinou, Protopapas, & Kalogirou, 2014; Oliver-Meneil & Artinian, 2002; Safeer, Cooke, & Keenan, 2006).

Advances are being made, with newer investigations focusing on the use of eHealth and TeleHealth for CVD and associated risk factors (Merriel, Andrews, &
Salisbury, 2014; Neubeck et al., 2016; Nolan et al., 2014; Winter, Sheats, & King, 2016). Future research is still warranted, as mentioned above there are still considerable gaps in the literature relating to lifestyle factors influencing CVD. When communicating about risks, this task becomes even harder given what has been termed as “The Perception Gap”: the considerable differences that are seen between the perception of risks by those in academic and scientific communities versus the general public (Ropeik, 2012). Miscommunications leading to poor understanding and misrepresentation, along with problems with health literacy and low levels of awareness, are still hindering successful communication strategies and behavioural changes for CVD (Lambrinou et al., 2014; Pickering et al., 2003; Ropeik, 2010).

1.3 Conclusion

Ireland has one of the highest European rates for CVD and they are the most common cause of death in the country (McGee, 2010). As discussed above in section 1.1.1, primary prevention, compared to secondary prevention, has been shown to be the more effective method for reducing the rates of CVD, and a key component of any primary prevention strategy is communicating health information to the public. Therefore, this thesis is focused on examining dual information processing of CVD risk within health communications. The following chapters describe the mixed method approach utilised across a number of theoretical-based, empirical examinations of health communications containing information about CVD threat appraisals and efficacy appraisals for the associated health behaviours. Chapter two presents a narrative review of the most relevant literature from dual processing theories of risk, judgement and decision-making. Chapter three tests the use of an incidental dual information processing manipulation on CVD risk perception based on Slovic’s risk-as-analysis versus risk-as-feelings model (Slovic, Finucane, Peters, & MacGregor, 2004;
Slovic, Peters, Finucane, & Macgregor, 2005). Informed from the results of study one (chapter three), chapters four, five and six present two studies that focused on an integral manipulation of the CVD health communications, and tested the propositions of the Extended Parallel Processing Model (EPPM; Witte, 1992; Witte, 2009; Witte, Meyer, & Martell, 2001). Chapter seven is a discussion of the results and findings from all three studies, and their contribution to the literature on dual information processing of CVD risks.
Chapter 2: Review of Dual Processing Theories

2.1 Dual Processing Theories of Decision-Making

Given that the large majority of research examining dual processing of risk perception grew from the body of literature examining decision-making, a review of such is presented first, with a focus on those from a social-cognitive perspective. Following which, a more in-depth examination of these dual-processing theories for health risks is presented. Lastly, specific dual processing theories of risk perception and their application to health are discussed, highlighting the areas still requiring investigation.

2.1.1 Early theories of dual processing in decision-making

One of the first prominent arguments for a dichotomy of affective and cognitive components in attitude formation, judgements and in turn, decision-making was posited by Zajonc (1980) who argued that some of our very first reactions to stimuli are affective, and that all of our perceptions contain some aspect of affect. In opposition to Lazarus (1982), Zajonc (1980, 1984) argued that these affective processes occur as part of our appraisals, and can be independent of cognitive processes, to the point where they can occur prior to cognitive-based ones. Defining affect as the emotional responses and feelings to an object, and cognition (termed ‘evaluation’ rather than cognition) as the thoughts, beliefs and judgements, further evidence was found for separate processes in the formation of attitudes towards such events and objects as blood donation, computers and snakes (Breckler, 1984; Breckler & Wiggins, 1989). Zajonc (1980) maintained that affective, as well as cognitive, reactions occurred automatically, and went on to guide judgment and choice by acting as orienting mechanisms.

From working with patients with damage to the ventromedial frontal cortices of the brain whose basic intelligence, memory and ability to think logically were intact,
but ability to “feel” was impaired, Damasio (1994) posited that human thought is made up of images, which are constructed to contain perceptual and symbolic representations (e.g., sounds, smells, ideas, words, etc.). Through learning, positive and negative feelings can become connected to these images, which in turn can be directly or indirectly connected to somatic states, such that negative feelings can “sound an alarm” and positive ones can act as “a beacon of incentive” for prospective outcomes (Slovic, Finucane, Peters, & MacGregor, 2007, p.1335). The brain-injured patients that Damasio and colleagues (1990) studied were found to have an impaired ability at anticipating future monetary losses and gains on a card selection game. From this, Damasio (1994) hypothesized that it was the absence of these emotional somatic markers, caused by damage to the frontal lobe, which resulted in the accuracy and efficiency of the patients’ decision-making to decrease.

As research into the role of affect and the dichotomy of affective and cognitive processes in attitude and judgement formation continued, more and more consideration was given to its influence for an array of topics, e.g., social judgements (Forgas, 1995); reasoning (Epstein, 1994; Sloman, 1996); economics (Fudenberg & Levine, 2006); consumer behaviour (Han, Lerner, & Keltner, 2007; Kahneman, 2011; Tuan Pham, 2004); and risk and benefits (Alhakami & Slovic, 1994; Finucane, Alhakami, Slovic, & Johnson, 2000). A large body of literature encompassing a number of different psychological disciplines now exists examining what are termed as dual-process theories of human behaviour. A significant number of these are based within cognitive and social psychology, and the vast majority of them are examining social judgement, reasoning, information processing and decision-making (Evans, 2008). The main similarity between all is the proposal of two distinct systems for processing: an affective or intuitive-based, unconscious and rapid system versus a cognitive or
analytical-based, conscious and slow one (Evans, 2003, 2008; Greifeneder, Bless, & Pham, 2011; Quartz, 2009; Reyna & Brainerd, 2011; Reyna & Rivers, 2008).

2.1.1.1 Cognitive and social-cognitive perspectives

Building from a cognitive perspective, Sloman (1996) presented one of the first theories to suggest two computational forms for reasoning; the first ‘System 1’ is associative, sourcing knowledge from personal experience, while also processing statistical information and correlations in the environment. On the other hand, ‘System 2’ is a rule-based system, learning comes from language, culture and formal systems. Information and representations within ‘System 2’ are deliberate, symbolic and utilise formal analysis (Osman, 2004). Research into such cognitive and neuroscience-based systems of dual processing for various forms of decision-making has continued and become more sophisticated with the use of computerised decision tasks and advances in imaging technology (Martin & Delgado, 2011; Schiebener & Brand, 2015).

In addition, with a heavy emphasis on memory and semantic processing, the fuzzy-trace theory (Brainerd & Reyna, 2001; Reyna & Brainerd, 1995) proposes a dual system for value-based representations: verbatim or gist. Individuals will use both when faced with a problem or situation that they must solve. The main premise behind the theory suggests that through learning, individuals store the vague gist of information for reasoning and decision making in fundamentally two ways. Verbatim representations are concrete, either the exact words or numbers that make up the precise surface of the information, while gist representations are more vague and contain the “bottom-line” meaning of the problem or situation (Reyna & Brainerd, 2011). Not content with the heavily cognitive-based dual process theories however, a large number of researchers have proposed dual process theories from a social cognitive perspective. Among some of the first were the models suggested by Chaiken and Trope (1999) and Kahneman and
Frederick (2002), both of which acknowledged the existence of two different modes of judging relevant information: one systematic or deliberate mode with an emphasis on abstract and impersonal targets, and a second heuristic mode with more of an emphasis on specific, personal and vivid thoughts and targets.

2.1.1.2 Evaluation

It should be noted that the number of dual process theories within the social cognitive perspective, as described by Kruglanski and Gigerenzer (2011), has reached “epidemic proportions”. Calls have been made for a uni-model that encompasses all the possible factors that can impact on social judgement and decision-making, to replace the multiple dual-process models with their varying terminology (Gigerenzer & Regier, 1996; Keren & Schul, 2009; Kruglanski & Gigerenzer, 2011; Osman, 2004). Furthermore, attempts have been made to combine broad dual process theories from both cognitive and social perspectives (Stanovich & West, 1999). As the names suggest, those from a cognitive perspective place greater emphasis on purely cognitive processes and structures, whereas those from a social cognitive perspective argue for greater consideration of the cognitive abilities that allow us to understand and interpret the behaviour of others (Spunt, 2015). Among the social cognitive dual process theories more emphasis is placed on topics such as consciousness (Falk, Berkman, Whalen, & Lieberman, 2011; Lieberman, 2009), free will and the impact of moral and legal influences on the individual’s behaviour and outcomes of such (Evans, 2008; Spunt, 2015). However, both the cognitive and social cognitive dual process theories, in comparison to dual process theories from other psychological perspectives (e.g., Slovic’s risk-as-analysis versus risk-as-feelings, Extended Parallel Process Model), place less of an emphasis on the role of affect and/or emotional influences within ‘System 1’ or the more intuitive based processing system (Evans, 2008).
With a number of similarities to the fuzzy-trace theory (Brainerd & Reyna, 2001; Reyna & Brainerd, 1995) the cognitive-experiential self-theory (CEST; Epstein, 1994; Epstein & Pacini, 1999) is one of the more prominent social cognitive dual-process theories. Epstein (1994) posited a dual-process theory of information processing emphasising the importance of individual differences in personality types (Reyna & Rivers, 2008). The theory posits that in processing information from everyday life, we do so in two fundamentally different ways: one intuitive, automatic, and ‘experiential’ system that emotions are explicitly linked to, and the other analytical, deliberative, verbal, and ‘rational’ system. The ‘experiential’ system encodes reality in the preconscious and utilises affective images and narratives. Therefore, memories are stored about events along with the linked emotional accompaniments. If the emotional accompaniments are positive, they guide the individual towards actions and thoughts that will reproduce the pleasant feelings. If not, and they are negative, the individual is guided towards avoidant thoughts and behaviours (Epstein, 1994). This is in comparison to the ‘rational’ system, which is affect free, operates in the conscious and processes knowledge analytically (see Table 2.1).

The CEST (Epstein, 1994; Epstein & Pacini, 1999) is distinct among the social cognitive based dual process theories as it posits a parallel-competitive structure for the two systems. Although the two systems have access to different forms of information and knowledge, they are competing processing styles (Evans, 2008). Similar to the work of Zajonc (1980) though, the CEST (Epstein, 1994; Epstein & Pacini, 1999) proposes that not only is the information from everyday life processed and stored along two different modes, but additionally the associated mode can impact and guide the judgement and choices of the individual.
### Table 2.1

*Comparison of the experiential and rational systems from the CEST (Epstein, 1994; Epstein & Pacini, 1999)*

<table>
<thead>
<tr>
<th>Experiential system</th>
<th>Rational system</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Holistic</td>
<td>1. Analytic</td>
</tr>
<tr>
<td>2. Automatic, effortless</td>
<td>2. Intentional, effortful</td>
</tr>
<tr>
<td>3. Affective: Pleasure-pain oriented (what feels good)</td>
<td>3. Logical: Reason oriented (what is rational)</td>
</tr>
<tr>
<td>4. Associationistic connections</td>
<td>4. Logical connections</td>
</tr>
<tr>
<td>5. Behaviour mediated by “vibes” from past events</td>
<td>5. Behavioral mediated by conscious appraisal of events</td>
</tr>
<tr>
<td>6. Encodes reality in concrete images, metaphors, and narratives</td>
<td>6. Encodes reality in abstract symbols, words, and numbers</td>
</tr>
<tr>
<td>7. More rapid processing: oriented toward immediate action</td>
<td>7. Slower processing: oriented toward delayed action</td>
</tr>
<tr>
<td>8. Slower and more resistant to change: Change with repetitive or intense experience</td>
<td>8. Changes more rapidly and easily: changes with strength of argument and new evidence</td>
</tr>
<tr>
<td>10. More crudely integrated: Dissociative, emotional complexes; context-specific processing</td>
<td>10. More highly integrated: Context-general principles</td>
</tr>
<tr>
<td>11. Experience passively and preconsciously; we are seized by our emotions</td>
<td>11. Experienced actively and consciously: We are in control of our thoughts</td>
</tr>
<tr>
<td>12. Self-evidently valid: “Experiencing is believing”</td>
<td>12. Requires justification via logic and evidence</td>
</tr>
</tbody>
</table>


In general when comparing across all such dual process theories, the main differences are contended in terms of the level of independence between the two systems and how they are connected (Keren & Schul, 2009; Kruglanski & Gigerenzer, 2011; Osman, 2004), the level of consideration given to affect within the various models (Hanoch & Vitouch, 2004; Slovic et al., 2005; Wang, 2006), the effect of multiple environmental cues on outcomes (Evans, 2008; Haidt, 2001) and individual differences (Burton, Heintzelman, & King, 2013; Stanovich & West, 2000). In their
review calling for a uni-model, Keren and Schul (2009) highlighted that the use of different names across the models, as well as vague terminology in descriptions and labelling, were a cause for serious concern.

In a similar review of dual-process theories for reasoning, judgement and social cognition, Evans (2008) acknowledged similar concerns: however, due to these differences and a lack of continuous distinction between the two systems across various models, as of yet a generic theory that encompasses all may not be possible. Evans and Stanovich (2013) argue that one general model to cover all theories would be misleading and most probably mistaken as it is not possible to conclude that different authors are referring to the same underlying systems within their models. Therefore it would not be appropriate to group all dual process theories together and claim they are the same (Evans & Stanovich, 2013).

2.1.2 Applications to health

Within the literature, examples can be found of cognitive and social cognitive dual process theories applied to various forms of health information, behaviours and outcomes (Breckler & Wiggins, 1989; Dhaliwal, 2011; Fagerlin, Zikmund-Fisher, & Ubel, 2005; Millar & Millar, 1990; Norman, 2009; Reyna, 2008; Reyna, Nelson, Han, & Pignone, 2015), and attempts at specialised dual process theories for attitude, judgement and decision-making in terms of health. The Cognitive-Affective Mismatch Hypothesis (Hiruma & Riddiford, 1984) was proposed in the early 90s, examining how the differences between cognitive and affective-based attitudes could impact subsequent health behaviours. In an early examination of the different influences from cognitive and affective-based processing, Millar and Millar (1993) showed how undergraduate students had a tendency to respond in an affective or cognitive-based manner depending on the type of health behaviour they were presented with. Furthermore, they responded
differently depending on the type of information they were given about different health behaviours.

At a similar time, the Self-Regulation Model of Illness (SRMI), based on the idea of illness representations, provided a model for how symptoms and emotions experienced by an individual when faced with a health threat can influence their perception of illness and subsequently their coping behaviour (Diefenbach & Leventhal, 1996; Leventhal, Diefenbach, & Leventhal, 1992). The model grew from the results of studies examining fear communications in the late 1960s by Leventhal (1970) and was originally referred to as the “Common Sense Model of Illness Representation” (CSM). It suggested that when presented with a health threat, an individual will engage in parallel processing of the information in two ways in order to try and understand the illness or disease threat: a cognitive processing level where external and internal stimuli evoke ‘cognitive’ illness representations that consider the perceived reality of the health threat, such as identity, timeline, causal, controllability and consequences based on prior health and illness experiences (Hale, Treharne, & Kitas, 2007). In parallel, an emotional processing level deals with the emotional reactions to the threat, such as fear, anxiety, annoyance, happiness or hope that can be evoked by the health-relevant stimuli (Diefenbach & Leventhal, 1996; Hagger & Orbell, 2003).

The model has been applied to a large number of health behaviours and outcomes (Hagger & Orbell, 2003), including patient behaviour after myocardial infarction (MI; Petrie, Weinman, Sharpe, & Buckley, 1996), adherence among individuals with chronic illness (Brandes & Mullan, 2014; Reynolds, 2003), diabetes self-management (Lange & Piette, 2006) and smoking behaviour in lung cancer patients (Browning, Wewers, Ferketich, Otterson, & Reynolds, 2009). Among a sample of 143 MI patients in New Zealand, Petrie and colleagues (1996) found that patients who
believed the illness was controllable or could be cured where significantly more likely to attend the cardiac rehabilitation course, and those who perceived that the illness would last for a short time and have less grave consequences were significantly more likely to have returned to work within six weeks of the myocardial incident. Browning and colleagues (2009) conducted the first longitudinal (6 months) study to examine the change in illness representations over time in lung cancer patients and their smoking behaviour, an important health-related behaviour change for such a population. The sample size of the study was quite small (n = 52) and unfortunately, a considerable number were lost at the 6-month follow up due to death (n = 29).

Among those who did complete the follow-up, a large majority of them still smoked. It was found that patients’ representations about the identity of the illness over time had increased, and in turn they reported experiencing increased disease and treatment-related symptomatology. The results of both studies examining lung cancer and MI patients are in line with Hagger and Orbell’s (2003) meta-analytic review of the SRMI. However, the results across the literature for the SRMI are not consistent. In a meta-analysis of the SRMI in relation to adherence among chronically ill patients (e.g., diabetes, hypertension, asthma), the authors reported low effect sizes from the analysis (-0.02 to 0.12) and found little support for a relationship between SRMI mental representations and different types of adherence behaviours. The meta-analysis included 23 studies that covered 12 different chronic illnesses, the most common being diabetes, hypertension and asthma, and assessed adherence to medication, diet and exercise, disease-specific adherence behaviours and self-reported adherence additionally. The conclusions of the meta-analysis (Hagger & Orbell, 2003) were in line with some of the first studies examining the SRMI (Diefenbach & Leventhal, 1996), that the model may be more appropriate for understanding adherence, rather than predicting it.
The SRMI posits a causal relationship between illness mental representations and outcomes, mediated by coping (Diefenbach & Leventhal, 1996; Leventhal et al., 1992); however, due to a large amount of cross-sectional research examining the SRMI there is a lack of evidence to support such casual links. Similar to other dual-process theories, there is a considerable amount of discussion around “what” the two system do but a deficiency in asserting “how” the systems actually operate (De Neys & Glumicic, 2008). Additionally, there are a lack of reviews consolidating relevant material in relation to dual-process theories and specific illnesses and outcomes. As the aim of this thesis is an examination of dual processes in terms of CVD risk perception and the associated health behaviours, dual process theories in terms of risk perception and health behaviours will now be discussed.

2.2 Dual Processing Theories of Risk Perception

Slovic and colleagues (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic, Peters, Finucane, & MacGregor, 2005) argued that risk is perceived and acted upon in two fundamental ways. Firstly, ‘risk as analysis’, where logic, reason and scientific deliberation work on risk assessment and decision-making. Secondly, ‘risk as feelings’, where instinctive and intuitive tendencies are relied upon when assessing risk. Slovic’s theory (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic et al., 2005) of two distinct systems processing risk falls under the category of dual process theories of judgement and decision-making (Evans, 2008), and was built on examinations of previous dual-process theories of information processing and previous research examining the role of affect in risk perception (Chaiken & Trope, 1999; Kahneman & Frederick, 2002; Sloman, 1996). The growth of which was similar to that of the social-cognitive based SRMI theory above. Early studies displayed the impact of fear, anger and dread on risk perception (Lerner, Gonzalez, Small, & Fischhoff, 2003; Lerner &
Sandman (1989) showed that dread had a significant role to play in determining public perception and acceptance of risk, while Lerner et al. (2003) and Lerner and Keltner (2000) displayed how fear can intensify risk estimates through uncertainty and situational control, and anger can reduce risk estimates through certainty and individual control.

The results of two similar studies showed that judgments of risk are made not only on what people think of the risk in question, but also by how they feel about that risk (Alhakami & Slovic, 1994; Finucane et al., 2000). Within their theory, Slovic and colleagues (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic et al., 2005) placed a great amount of importance on the role of affect and in turn, what has become known as the affect heuristic. Early assessments of the affect heuristic demonstrated its influence in decision-making by making certain pieces of information more salient for the individual, thus increasing the speed at which decisions could be made (Schwarz & Clore, 1988). Defining affect as the “faint whispers of emotion”, and the amount of specific goodness or badness (a) experienced as a feeling state (with or without consciousness) and (b) demarcating a positive or negative quality of a stimulus (Slovic & Peters, 2006, p. 322), the model highlighted the speed and usefulness of affect heuristics for risk assessment and decision making in real-world environments. This speed was particularly useful in environments where complex and large amounts of information need to be processed and in situations where mental resources maybe limited or under a time pressure.

Early examinations into the affect heuristic had suggested that an inverse relationship existed between the perceived risk and the perceived benefit of an activity. That is, when the risk of an activity is judged to be high, the benefit of that activity tends to be judged as being low, and vice versa (Alhakami & Slovic, 1994).
Furthermore, this inverse relationship was strongly associated with the level of positive or negative affect associated with the activity (Finucane et al., 2000) as displayed in Figure 2.1.

**Figure 2.1.** A model displaying the inverse relationship between perceived risk and perceived benefit of nuclear power, and how positive and negative affect associated with the nuclear power can impact this inverse relationship. Support for this model was found by Finucane, Alhakami, Slovic, & Johnson (2000). From “Risk perception and affect,” by P. Slovic, and E. Peters, 2006, *Current Directions in Psychological Science, 15*(6), p. 323. Copyright 2006 by Association for Psychological Science.

Slovic, Monahan, and MacGregor (2000) in their study building on the findings above and those of others (Denes-Raj & Epstein, 1994), showed the difference between these two information processing systems for risk perception. Experienced forensic psychologists and psychiatrists were asked to judge the likelihood that a mental patient would commit an act of violence within 6 months of being discharged from the hospital. Results showed that when clinicians were given another expert’s assessment of the patient’s risk of violent behaviour framed in terms of a relative frequency (e.g. “20 out of every 100 patients similar to Mr. Jones are estimated to commit an act of violence”), they labelled the patient as more dangerous than did the clinicians who were shown the same statistical risk expressed as a probability (e.g. “patients similar to Mr.
Jones are estimated to have a 20% chance of committing an act of violence” (Slovic et al., 2000). Among the clinicians who received the risk as a relative frequency, 41% refused to discharge Mr. Jones. In comparison those who received the risk framed as a probability, 21% refused to discharge him, showing that the relative frequency risk group perceived a greater risk (Slovic et al., 2000). It is believed that the relative-frequency information activated more affect-laden images in the clinicians as they processed the information, which in turn induced perceptions of greater risk (Slovic et al., 2000).

This study highlighted how affective processes can impact information processing and how similar these influences can be to those posited by Epstein (1994), Sloman (1996) and others in dual process theories of reasoning, judgement and decision making, as well as the ‘risk as feelings’ model proposed by Loewenstein, Weber, Hsee, and Welch (2001). Similar to the findings of Damasio, Tranel, and Damasio (1990a), researchers into risk perception have gone further and argued that without these affective mechanisms the information lacks a certain level of meaning and therefore, the information will not be utilised within the decision making process (Bateman, Dent, Peters, Slovic, & Starmer, 2007). More recent research has provided evidence for the speed and latent nature of affective processing for decision-making, in comparison to cognitive processing (Saunders & Buehner, 2013).

There are limitations and negative consequences to dual processing of risks that should be noted. As with other dual process models for decision-making, questions have been raised about the potential relationships between affective and cognitive risk beliefs, with calls in the literature for future research to consider the possible inter-relationships among affective and cognitive-laden risks (Janssen, Waters, van Osch, Lechner, & de Vries, 2014). While discussing the model, Slovic et al. (2004)
acknowledged that it is not possible for all the information in our environments to be represented in an affective manner. Using the example of young smokers, they posit that young people make the decision to begin smoking based on affective impulses and fail to consider fully the rationality argument and risks against taking up such a damaging behaviour. Similar criticisms to other dual process theories have been highlighted, in terms of a lack of concrete descriptions around how risk as analysis and risk as feelings processing works (Seligman & Kahana, 2010) and that the model is too simple, particularly in terms of specific and mixed emotions, moods and valenced feelings that have been caused by the stimuli being presented to the individual (Slovic & Peters, 2006). A considerable negative consequence to affective reactions is that they can be deliberately manipulated and used by marketing and advertising to guide public behaviour for negative reasons (Slovic et al., 2004).

2.2.1 Dual processing theories of risk perception with health behaviour change theories

Along with the results from dual information processing models (Prati, Pietrantoni, & Zani, 2011), recent research has shown that the examination of benefits and risks, or pros and cons, of a particular decision can be influenced early on by affective mechanisms. From the examples above by Slovic and colleagues (Alhakami & Slovic, 1994; Finucane et al., 2000; Slovic et al., 2004; Slovic et al., 2000; Slovic & Peters, 2006), it can be seen how the dual process theory of risk perception posits that pleasant feelings towards an activity can result in the risks being judged as low and the benefits as high, while unpleasant feelings can result in the perception of high risk and low benefit. As with the numerous decision making models, in the past many health behaviour change models posited that individuals made decisions about their health in systematic ways (Chen, 2015). Similarly, to the other dual process theories, this belief
has begun to change and greater consideration is paid to the potential impact of intuitive or affective mechanisms in decision making for health. In a number of papers, Slovic did use the example of smoking and cancer risk perception (Slovic et al., 2004; Slovic et al., 2005), however the vast majority of literature investigating dual process theories in terms of decision making use gambling examples (Bateman et al., 2007). The amount of research investigating dual processes and risk in relation to other behaviours and outcomes is quite small in comparison to those of gambling.

Most of the health behaviour change models, similar to decision-making theories, will attribute an individual’s decision to complete a particular behaviour based on examining the perceived costs/risks and benefits of carrying out that behaviour (Chen, Tsai, & Chou, 2011). Developing from a body of social cognitive models, the HBM was designed to predict health-promoting behaviours, by specifying the particular beliefs and attitudes that acted as proximal determinants for those behaviours (Jones, Smith, & Llewellyn, 2014). The HBM proposes five core determinants for health behaviours; perceived severity, perceived susceptibility, cues to action, perceived benefits and perceived barriers and there was early evidence to support its ability to predict health behaviours (Harrison, Mullen, & Green, 1992; Janz & Becker, 1984a; Zimmerman & Vernberg, 1994). Within the model, one of the key determinants is the perceived barriers associated with the course of action. However, the model has been criticised for its lack of consideration of the dual nature of decision making (Chen et al., 2011). Furthermore, more recent systematic reviews and meta-analyses of the model have not been as supportive as previous ones (Carpenter, 2010; Jones et al., 2014).

Through structural equation modelling on data from nearly 600 adults in the United States, Chen et al. (2011) sought to incorporate affect, as well as social trust, into a dual-mode framework of health decision making in terms of vaccination risk
perception and behavioural intentions. The analysis supported a model with bidirectional pathways between affect and participants’ systematic beliefs, where greater positive affect was significantly predictive of higher levels of perceived benefits and perceived susceptibility, and such participants were more likely to get immunised against the hypothetical avian flu. A similar attempt was made at considering the ‘risk-as-feelings’ hypothesis (RaF; Loewenstein et al., 2001) within the Theory of Planned Behaviour (TPB; Ajzen, 1991, 2002) to examine how consequence-based and affect-based judgment evaluations can impact behavioural intentions for health (Kobbeltvedt & Wolff, 2009). While both theories are aimed at trying to understand the structural antecedents of human behaviour and in turn, use this understanding to predict future behaviour, the TPB (Ajzen, 1991, 2002) places an emphasis on the intentions of behaviour as the direct antecedents. Attitudes, social norms and perceived behavioural control can all additionally impact these intentions (Kobbeltvedt & Wolff, 2009).

In comparison, the RaF (Loewenstein et al., 2001) places an emphasis on how feelings can play a role in determining behaviour. However more recently, Fishbein (2007) argued that the TPB could be used to predict the exact mechanisms in which emotions can influence behaviour, either directly or indirectly impacting behaviour as an attitude, outcome or expectancy. Kobbeltvedt and Wolff (2009) conducted two studies, the first to investigate the predictive power of shared and unique variables of the TPB and the RaF for intentions to have unsafe sex and the second to examine if behavioural intentions are driven by consequences or feelings in terms of two behaviours. Participants’ intentions to partake in unsafe sex were measured as it was considered a positive hedonic experience with potentially negative consequences compared to participants’ intentions to partake in back surgery, a negative hedonic experience with potentially positive consequences. Through block-wise regression
analyses, study one and two provided support for both feelings-based and consequence-based reasoning underlying the decision to take part in unsafe sex and back surgery (Kobbeltvedt & Wolff, 2009). In study one, variables such as global evaluations including affective qualities, social-cognitive aspects (e.g., norms among peer groups), control-expectations, and how vividly one is able to imagine each of the potential consequences, were all significant predictors of behavioural intentions.

Study two highlighted further the role of outcome-expectations from the TPB and affective subcomponents in attitudes from the RaF as playing significant roles in intentions (Kobbeltvedt & Wolff, 2009). Research such as this is in line with suggestions by others that affect can play a role in directing and motivating health behaviours, where pleasant feelings drive people towards repeating the actions that led to the pleasant feeling initially and unpleasant feelings encourage people to avoid the actions that led to the unpleasant feeling (Västfjäll & Garling, 2006). In general though, throughout the literature examining the interplays between emotions, risk perceptions and subsequent behaviour, there are considerable inconsistencies. Many studies display positive correlations between high levels of risk perception and protective behaviours (Dolinski, Gromski, & Zawisza, 1987; Weinstein, 1982, 1983), while others have found negative correlations (Svenson, Fischhoff, & MacGregor, 1985; van der Velde, Hooijkaas, & van der Pligt, 1991), and some have even found no evidence to support either (Joseph et al., 1987; Svenson et al., 1985).

With the growing focus on affect in decision-making, there has been a renewed interest in trying to better understand the affective aspects of risk perception (Wardman, 2006); however, the examination of its role within dual process models in the perception of health risks is not as extensive. Previous research has shown that different mood states and emotions can impact risk perception and information processing.
Slovic (2001) posited that the affect heuristic could work to such an extent that if positive feelings are associated with a risk object, then participants have a tendency to underestimate the potential harm it may cause and in the same instance, overestimate the potential benefits. In examining discrete emotions among decision making, Lerner and Keltner (2001) showed that fearful people have a greater tendency to express more pessimistic risk estimates and risk-averse choices, compared to angry individuals who may be more inclined to express optimistic risk estimates and risk-seeking choices. Emotions and moods can cause decision-making and risk perception to change by influencing or biasing the processing of perceived benefits and risks, in an approach that has become known as ‘affect-priming’ or ‘affect-as-spotlight’ (Chen, 2015; Forgas, 1995; Peters, Lipkus, & Diefenbach, 2006).

2.2.2 Affective reactivity

Individual differences in affective reactivity (the intensity of affective reactions) have also been found to impact judgments, decisions and risk perception (Larsen & Diener, 1987; Peters, Burraaston, & Mertz, 2004; Rusting, 1998). Rusting (1998) presents three conceptual frameworks for how mood states and personality traits impact the processing of emotional information: the traditional approach, a moderation approach, and a mediation approach. All three frameworks argue for different methods by which individual differences in personality traits and mood states impact emotional information processing. The traditional approaches examine how mood states (e.g., positive/negative mood, sadness/joy, anxiety, and anger) and personality traits (e.g., extraversion/neuroticism, positive/negative affectivity, repression/sensitization, subclinical depression, trait anxiety, and trait anger/hostility) separately impact perception, attention, judgment, recall and recognition within emotional processing (Rusting, 1998). On the other hand, the moderation and mediation approaches argue
that combined effects from both are influencing emotional processing; within the moderation approach the suggestion is that temporary mood states and stable personality traits interact, with the effects of the temporary mood depending on individual differences in stable personality traits, to influence emotional processing. In the mediation approach it is argued that individual differences in personality traits predispose the individual to experience certain mood states, which in turn impacts their emotional processing (Rusting, 1998).

Peters et al. (2004) took a slightly different approach and argued for the influence of incidental and integral affect to explain the difference in the strength of individual’s affective reactivity. Incidental affect or emotions (e.g., positive or negative mood) are those that arise independently of the decision-making task at hand (Loewenstein & Lerner, 2003; Wardman, 2006). Integral affect refers to the positive or negative feelings that arise from the stimulus presented within the decision-making task, and can arise from the individuals’ previous experiences and thoughts (Peters, Lipkus, et al., 2006; Wardman, 2006). Incidental and integral affect have recently been used as a framework to organise different affective influences in judgment and decision-making. Peters et al. (2004) posited that an individual’s general disposition for integral and incidental affect resulted in the level of their affective reactivity. Gray (1981, 1982) hypothesised that such differences in affective reactivity where due to activation of the behavioural inhibition system (BIS), which is sensitive to outcomes of punishment and non-reward. Similar to Epstein's (1994) CEST, where activated feelings of an anticipated outcome depending on whether they are positive or negative can motivate or deter thoughts and behaviours towards that anticipated outcome, Gray (1981, 1982) argued that individuals high in BIS sensitivity react more to the negative-
affect-provoking aspects of a situation and then in turn, may work to avoid such situations.

Research examining the BIS and risk perception suggests that these individuals high in BIS negative reactivity worry more and are more nervous about the anticipated outcome (Carver & White, 1994), and in turn, may perceive more of a risk (Gasper & Clore, 1998). Only recently has research begun to examine how individuals differ in the strength of their affective reactivity to risk stimuli (Peters, McCaul, Stefanek, & Nelson, 2006). Further research is needed to elucidate the situations that can induce or inhibit affect-based responses to certain hazards for specific risks and their communication (Dohle, Keller, & Siegrist, 2010). Calls have been made within the literature for more research into thorough examinations of both, and explicitly examining the effects of incidental affect induction (Visschers et al., 2012). In their review of affect-inducing communications, Visschers and colleagues (2012) stated that most examples of incidental affect induction are seen through emotion induction, and more needs to be done to assess their influence on the appraisals of the specific risks.

2.3 Dual Processing and Risk in Health

Decision-making in terms of health can be more complex and difficult, than certain financial and gambling decisions, due to the potential implications for the person’s psychological and physiological state (Yang et al., 2012). As mentioned earlier, the Cognitive-Affective Mismatch Hypothesis (Hiruma & Riddiford, 1984) was proposed to predict how the differences between cognitive and affective-based attitudes could impact subsequent health behaviours. The authors argued that consideration needed to be paid to the type of behaviour under investigation, and the differences that may exist in terms of the impact of cognitive and affective processes on specific health behaviours. If the attitude component of the thought (cognitive or affective) and the
attitude component driving the behaviour (again, cognitive or affective) were similar, then there would be a stronger attitude-behaviour relationship, and the individual would be more likely to carry out the behaviour (Hiruma & Riddiford, 1984; Millar & Millar, 1993). In two studies examining such, Millar and Millar (1993) distinguished between disease detection health behaviours (detect an illness, but do not directly make the individual more healthy, e.g., cholesterol check, blood pressure checks, regular dental examinations,) and promotion health behaviours (behaviours that directly make the individual more healthy, e.g., eating a low-fat/cholesterol diet, wearing sunscreen, taking part in vigorous exercise three or more times a week for cardiovascular fitness).

Among undergraduate students, the first study found that when presented with descriptions of disease detection health behaviours and promotion health behaviours participants were more likely to choose more affective responses for the former and cognitive responses for the latter. Following on from the results of the first study, the authors (1993) hypothesised that if participants were choosing their responses differently dependent on the type of health behaviour, then it was possible that they would respond differently to emotional and informational persuasion information about such health behaviours, even at follow-up. After the initial session, participants were re-tested again after four weeks and received either informational or emotional information about either two detection or two promotion health behaviours. Participants were again assessed for their attitude and behaviour responses to the health behaviours. Similar results to study one were found, with participants utilising cognitive statements more in relation to the promotion health behaviours, rather than the disease detection behaviours.

More recently when assessing affective and cognitive attitude measures, Lawton, Conner, and McEachan (2009) found that affective attitudes of nine health-risk
(e.g., binge drinking, daily alcohol consumption, smoking, speeding) and health-promoting (e.g. brushing teeth, exercise, fruit and vegetable consumption, eating a low-fat diet, self-examination of breasts or testicles) behaviours were significantly more powerful predictors of the behaviour at a one-month follow-up after controlling for intention, than cognitive attitudes. The study included a large number of behaviours, and not all were health-related. However, similar results had been reported in an earlier assessment of the most appropriate risk perception measures for predicting one specific health behaviour, namely influenza vaccination (Weinstein et al., 2007). The authors found a difference for when participants were asked about their perceived risk in terms of their feelings, rather than in terms of a pure cognitive-based probability judgement. Although the study supported the use of probability-based measures of risk perception for health behaviours, they highlighted the lack of consideration of risk-as-feelings within decision-oriented theories of health behaviours and called for more investigations of such for other health behaviours. Previous studies have shown that risk perceptions for specific health threats can be considered more important, in comparison to behaviours that have a wide range of health consequences (Brewer et al., 2007). The same could potentially hold for specific versus general health behaviours.

Janssen and colleagues (2011, 2013; 2012) have conducted a number of studies investigating the most appropriate and reliable measures of risk perception in terms of health behaviours, and within such have examined cognitive and affective based mechanisms of perceived cancer risk. Within their most recent examination (Janssen et al., 2013), they acknowledged that in comparison to other decision making behaviours, there was still little research examining the role of dual aspects of risk probability in health behaviour theories and in particular the impact affective aspects could have on health behaviours. They attributed this to much of the previous research focusing on the
cognitive dimensions of perceived likelihood or only the examination of affective
aspects within the direct relationship between risk perception and health behaviour, but
not both together (Janssen et al., 2011; Janssen et al., 2012; Weinstein et al., 2007).
Within their first study (Janssen et al., 2012), they assessed the use of cognitive and
affective likelihood measures for different cancer related behaviours or behavioural
intentions (e.g., smoking, fruit consumption, sun protection and sunbed use). Confirmatory factor analysis supported a two-factor model, that is, affective and
cognitive likelihood separately rather than combined. The results provide greater
support to a dual model of rational and intuitive judgements rather than a uni-model,
within risk perception for health behaviours.

Affective likelihoods were also found to have significantly greater correlations
with the four cancer-related health behaviours (Janssen, van Osch, Lechner, Candel, &
de Vries, 2012). Although the results were not consistent for all four behaviours, fruit
consumption was found to have lower associations between the two likelihoods and the
outcome behaviour. Furthermore, the only significant longitudinal associations for both
likelihoods were found for sun protection. Janssen, van Osch, de Vries, and Lechner
(2013) sought to examine the direct and indirect behavioural effects of affective (‘I
feel…’) and cognitive (‘I think…’) likelihood in the behavioural decision-making
process. Similar to the results of Lawton et al. (2009) above, it was found through
structural equation modelling while controlling for attitude, social influence and self-
efficacy, that participants’ affective likelihood, but not cognitive likelihood, was
directly related to their sun protective behaviour. However, in general they noted that
investigations into the differences between cognitive and affective-based judgements
and decision-making, especially in terms of specific health risks, is lacking and more
needs to be done examining how feelings of risk can be influenced, and the exact circumstances under which it can be done (Janssen et al., 2013).

A limited number of investigations have been conducted into dual processing in terms of health decision-making. However, such investigations are specific for one particular disease and/or health behaviour, which is to be expected particularly for risk perceptions. Although risk perceptions can be optimistic or pessimistic, they are domain-specific (Radcliffe & Klein, 2002) and differences have been noted across various diseases, health behaviours and populations. As mentioned above Janssen and colleagues (2011, 2013; 2012) completed a number of studies accessing dual processing for risk perception of cancer and associated behaviours. Recent analyses have looked at cognitive and affective influences in the perception of risk for ovarian cancer (Peipins et al., 2015), screening for colorectal cancer (Hay et al., 2016), exercise intentions among individuals with Type 2 diabetes (Portnoy, Kaufman, Klein, Doyle, & de Groot, 2014), A/H1N1 influenza vaccination (Renner & Reuter, 2012), and general health risk perceptions among individuals living in poverty (Freimuth & Hovick, 2012). In contrast to most of the examples given above, for food safety risks, it was found that cognitive reactions to the risk communications were more predictive of participants behavioural intentions (De Vocht, Caubergh, Uytendaele, & Sas, 2014).

Differences among populations were highlighted in a study comparing cognitive processing strategies, and positive and negative emotions for decision-making (enrolment in a potential clinical trial) between two large samples, one of cancer patients and the second of a representative national sample in the United States (Yang et al., 2012). Using a similar format to that of Kobbeltvedt and Wolff (2009), the authors included aspects of the risk information seeking and processing (RISP) model (Griffin, Dunwoody, & Neuwirth, 1999), rather than the RaF (Loewenstein et al., 2001), into the
Overall, emotions played a greater role in cancer patients’ decision making about clinical trial enrolment, whereas cognitive processing strategies and normative beliefs were given more emphasis among the national representative sample. However, optimistic feelings were found to have a significant effect on cognitive processing within the national sample (Yang et al., 2012). The study emphasised the different cognitive and emotional factors, and the varying interplay between the two, that can be more salient for healthy and disease cohorts.

Despite these investigations, very little has been completed in relation to CVD. More needs to be done in order to better inform communication practises for CVD risks given its current rates throughout the world, as the leading cause of death and disability (Mendis et al., 2011; WHO, 2016). Furthermore, throughout the literature, there is considerably more research examining affective or cognitive influences alone. For disease and health behaviours, Chen et al. (2011) explored the impact of affective mechanisms on decisions to carry out different health behaviours. Using the examples of a flu vaccine and a colonoscopy, and the positive and negative affect that is usually associated with each, it was suggested the individuals would be more likely to get the vaccination due to the positive thoughts associated with such versus the negative thoughts associated with going through a colonoscopy procedure. These results, along with previous research (Berndsen & van der Pligt, 2005; Denes-Raj & Epstein, 1994; Lawton et al., 2009), emphasise the role that feelings of risk can play in health-related decision making and in turn, health behaviours.

### 2.3.1 Health communication

One of the first steps in trying to change health decision-making and behaviour is to provide patients and the general public with information about their health risks and the associated behaviours (Katz & Wajngarten, 2015). However, levels of health
literacy among the public are generally quite low (Lambrinou et al., 2014; Pickering et al., 2003). Communicating risks and trying to disentangle their effect is extremely important for fully understanding health decision-making. Examples from research into cancer risk perception have shown how the level of risk perceived by the individual can impact on their health protective behaviours (Peters, McCaul, et al., 2006). Furthermore, a recent meta-analysis by Sheeran, Harris, and Epton (2014) demonstrated the significant impact of risk perceptions and appraisals on intentions and behaviours.

Calls have been made for research to examine not just attempts to increase understanding of the health risks, but additionally the cognitive and emotional processes that occur alongside such and their possible impacts on health decision-making and subsequent behaviours (Janssen et al., 2013; Janssen et al., 2012; Klein & Stefanek, 2007). Some authors will argue more for the importance of cognitive processes over emotional ones, and vice versa (Klein & Stefanek, 2007). With the rise in dual process theories, more and more investigators are advocating for the need to consider the interplay between both (Janssen et al., 2013; Janssen et al., 2012). In previous research into methods of communicating health risks, negative emotions such as fear and dread have been employed to try and motivate the public to increase or decrease various health behaviours (Tannenbaum et al., 2015).

Not as much attention has been paid to the impact of positive emotions on such and calls have been made for more investigations into specific moods and emotions (Visschers et al., 2012). There is a large body of research examining the detrimental effects of negative emotions on health and negative affects (e.g., depression, anxiety, pessimism) are established as risk factors for CVD (Rozanski, 2014). In a longitudinal assessment of the potential effects of positive emotions, Richman and colleagues (2005) found that hope and curiosity in particular could have a protective impact on
hypertension. A cohort of over a thousand patients were assessed over a two-year period for disease outcomes (one of which was hypertension) and positive emotional traits. After controlling for a number of confounders (e.g., health behaviours), it was found that hope was significantly inversely related to a diagnoses of hypertension, and higher levels of hope were equated to a 35% decrease in the odds of developing hypertension at the one year follow up (Richman et al., 2005).

2.3.1.1 Processing of health information

In order to produce more effective health communications, greater understanding of how individuals process information is required. Peters, Lipkus, et al. (2006) highlighted the four different functions affect can play in health communications: 1) affect as information, 2) as a spotlight, 3) as a motivator and 4) as common currency. In turn, the authors discussed the varying results in health judgement and decision-making that can arise for each of the four affective functions and emphasised the need for consistent and empirically sound methods when examining each. A number of examples from research into decision-making around cancer have highlighted the associations between affect and decision-making (Farrell, Murphy, & Schneider, 2002; Myers, 2005), as well as the different results that can arise from varying the information presented about cancer screening and chemotherapy (Edwards, Unigwe, Elwyn, & Hood, 2003). In a Cochrane review of personalised risk information, the authors discuss and show how emotional factors can impact the decisions people make about their screening behaviours; consequently, suggestions have been made for more consideration of specific emotions and their influence on affective appraisals of health risks (Visschers et al., 2012).

In relation to the cognitive based aspects of risk perceptions within health communications, there is also a considerable body of literature considering differences
with numeracy and how these can impact judgements and decision-making (Ancker & Kaufman, 2007; Peters, Hibbard, Slovic, & Dieckmann, 2007; Reyna & Brainerd, 2007). The large amounts of health information that are readily available to the general public in recent times typically include numerical information related to the risks or probabilities of certain health threats and benefits (Reyna, Nelson, Han, & Dieckmann, 2009). Often this information is presented with the assumption that the general adult population is able to understand such numerical information (e.g., ratios, frequencies, odds ratios, etc.), and will conduct their decision-making process in a rational and purely cognitive way. A number of studies have shown that many adults have difficulty with such numerical information (Ancker & Kaufman, 2007; Peters et al., 2007; Reyna & Brainerd, 2007), where they neglect information in terms of the denominator, they let high frequencies influence their probability judgements and display ratio bias (Reyna & Brainerd, 2008).

There are still considerable gaps in the literature on both the affective and cognitive processes for risks and medical decision-making arising from health communications (Operskalski & Barbey, 2016; Visschers et al., 2012). However, even less has been conducted on dual processes of risks and medical decision-making. More research needs to be carried out on cognitive and affective mechanisms of risk communications to elucidate the circumstances in which affective or cognitive likelihood maybe more persuasive for health decisions or the possible interplays between both (Janssen et al., 2012). Furthermore, risk communications that combined cognitive and emotional aspects have been suggested as providing more efficient information for the individual and guiding them to perform more sound judgement and decision-making (Finucane & Holup, 2006). This thesis will aim to present an
examination of dual information processing specifically for CVD risk and the associated health behaviours.

2.4 Summary and Future Research

Informed from the narrative review of dual processing theories of risk, judgement and decision-making included in this chapter, the overall objective of this thesis was to examine dual information processing of CVD risk communications through empirical manipulations of both information processing modes, and to examine the effect of such on risk appraisals for CVD and efficacy appraisals for the associated health behaviours. The thesis sought to address the lack of consideration given among general and health dual processing theories for the role of affect and the lack of examinations into CVD risk communications compared to other diseases.

As mentioned above a number of researchers have identified a gap in the literature surrounding the exact situations that can induce or inhibit affective and cognitive based responses to certain risks (Dohle et al., 2010; Visschers et al., 2012). In order to address such, the current thesis examined both incidental and integral manipulations of dual information processing for CVD risk communications. Incidental aspects of the manipulation are considered as those which are generated prior to and independently of the exact content of the manipulation, but which have an indirect or direct impact on the resulting judgements (Wardman, 2006). Whereas integral aspects are those which are associated with the particular context or content of the manipulation (Lerner & Keltner, 2000). Previous research has suggested that integrated methods for manipulations within health communications, where the manipulation of dual information processing was included within the CVD risk communication, can produce different results (Peters et al., 2004; Visschers et al., 2012; Wardman, 2006). To the
best of the author’s knowledge, no other studies have examined both incidental and integral manipulations for dual information processing for CVD risk communications.

Even though previous calls have been made in the literature for equal consideration of both cognitive and affective processes when examining health decision making and risks (Chen et al., 2011; Hagger & Orbell, 2003; Hanoch & Vitouch, 2004; Wang, 2006), there is still a considerable gap in the body previous of research for equal assessments of both within studies. The vast majority of the risk perception literature focuses only on cognitive aspects (Janssen et al., 2013). This is despite the body of evidence from Slovic and colleagues (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic et al., 2005) displaying the differing effects of cognitive and affective processes for risk perceptions across a range of threats. Even though there is a lack of research examining risk appraisals in CVD, the body of literature assessing other health risks would suggest that differences would be seen in affective versus cognitive processing of CVD risks (Carpenter, 2010; Finucane et al., 2000; Jones et al., 2014). Therefore, all three studies within this thesis focused on testing dual information processing manipulations of CVD risk communications in order to provide future insight into the most effective communications and to help with the lack of information about “how” both information processing modes may potentially impact on CVD threat appraisals and efficacy appraisals for the associated health behaviours (De Neys & Glumicic, 2008).

Given the role of health communications within primary prevention (see section 1.2), it is important that focused, experimental tests, which are guided by theory, are completed on specific health risks. Previous research has shown that what is effective in one communication for a specific disease, may not carry over and be effective for another (Lawton et al., 2009; Millar & Millar, 1993). Furthermore, as highlighted in
section 2.3 health decisions can be more complex and impacted by a number of cognitive and affective influences, more so than other decisions (Yang et al., 2012). Therefore, the aim of this thesis was to present empirical tests, utilising mixed method approaches (e.g., incidental and integral examinations of dual information processing, quantitative and qualitative methodologies) of dual information processing for health communications about CVD and the associated health behaviours.
Chapter 3: Priming of Dual Information Processing for CVD Risk

3.1 Introduction

3.1.1 Dual processing and risk perception in health communication:

Priming

Following on from Peters, Lipkus, et al. (2006) and the four different functions of affect within health communications (see section 2.3.1.1), the role of affect as information for risk perception within health communications will now be considered. Aligned with considering the different functions of affect within health communications, it is also important to consider the distinction between incidental and integral affect (see section 2.2.2). Both can impact health risk perceptions (Klein & Stefanek, 2007), and have been utilised together and separately with helping to better understand the role of affect within attitudes, judgement and decision-making (Peters, Lipkus, et al., 2006; Slovic, Finucane, Peters, & MacGregor, 2002). When considering affect as information, the focus is placed on incidental affect, rather than integral (see section 2.2.2 definitions of incidental and integral affect; Bandyopadhyay, Pammi, & Srinivasan, 2013).

Using the same definition for incidental affect as Lerner and Keltner (2000), Waters (2008) compiled the first comprehensive review of its influence on risk perceptions for understanding and perceiving health risk information. Similar to the studies of Slovic and colleagues (Alhakami & Slovic, 1994; Finucane et al., 2000; Slovic & Vastfjall, 2010), Waters (2008) concluded that positive affect results in more optimistic likelihood estimates of risk, compared to negative affect, which is more likely to lead to more pessimistic likelihood estimates. This finding was consistent and predictable across 16 studies that used a variety of affect induction methods (e.g., induced affect experimentally or used a naturalistic affect manipulation), measurement
techniques (e.g., State-Trait Anxiety Inventory, Profile of Mood States, Positive Affect Negative Affect Schedule, and the Differential Emotions Scale) and hazard domains (e.g., health hazards, gamble outcomes, terrorist attacks, positive and negative events, etc.).

In a more recent meta-analysis, Portnoy and colleagues (2014) examined the independence of worry from risk perceptions, the effectiveness of methods to change worry and the varying impact of such on risk perceptions. From 73 studies, the authors concluded that worry and perceived susceptibility are independent, but related constructs. Additionally, research supports the ability to manipulate one, without affecting the other, with a medium overall effect size for perceived susceptibility and a small effect size for worry. For health behaviour change theories, they acknowledged a gap in many studies between the perceptions of risk for a particular health threat and the outcome on the associated health behaviours (Portnoy, Ferrer, et al., 2014). Unfortunately, the meta-analysis only considered worry within the range of emotions that could potentially impact health perceptions; however, this is unsurprising given the large focus on negative emotions within the literature.

From other disciplines in psychology, while investigating the neural bases of emotional and cognitive processing through neuroimaging, an array of methods and tasks measure and manipulate the level of emotional and cognitive processing, such as straightforward image presentation (Kienast et al., 2008), an affective Go/No Go task (Brown et al., 2012; van Holst et al., 2012), an emotional oddball task (Briggs & Martin, 2009; Melcher, Born, & Gruber, 2011), and different kinds of basic, numerical and emotional Stroop tasks (Blair et al., 2007; Froeliger, Modlin, Wang, Kozink, & McClernon, 2012). Among the various methods for affect manipulation (recalling emotion-laden events, exposing participants to positive or negative events, video clips,
pictures, music or written passages), image-based ones are the most widely utilised (Waters, 2008) and have predominantly been found to be effective (Gerrards-Hesse, Spies, & Hesse, 1994). Additionally in their meta-analysis, Portnoy, Ferrer, et al. (2014) found that the length of the affective manipulation did not significantly impact the effect sizes for the change in emotional or risk perception outcomes.

Utilising positive, negative and neutral images from the International Affective Picture System (IAPS) database (Lang, Bradley, & Cuthbert, 2008), Bandyopadhyay and colleagues (2013) displayed the differing effects that incidental affect can have on the outcomes of basic decision-making task. The IAPS are a set of normative emotional colour photographs developed by the Centre for Emotion and Attention (CSEA) at the University of Florida for use in studies examining emotion and attention (Lang et al., 2008). After receiving a pleasant, unpleasant or neutral prime, participants in Bandyopadhyay and colleagues’s (2013) study were asked to pick one of three doors when given probabilities, in fractions, about the likelihood of winning following their choice. The authors found that when uncertainty was high, participants who had received the pleasant prime took significantly longer to make their choice. Although when uncertainty was low, the same individuals in the pleasant condition were faster with their choices (Bandyopadhyay et al., 2013). Results such as these build on the previous body of research from Slovic and colleagues investigating decision-making (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic et al., 2005), and are similar to the results of others (Cahir & Thomas, 2010; Scheibehenne & von Helversen, 2014).

As with much of research examining decision-making, the number of studies investigating risk and health are not as numerous as those examining basic choice or financial tasks. However, in a study utilising emotional and neutral movie clips, participants induced into the negative mood were less likely to take a risk based on
three ‘life dilemmas’ adapted for Chinese culture (Yuen & Lee, 2003). More recently in a similar use of movie clips to induce positive or negative moods, Mohanty and Suar (2014) assessed the difference of such moods on three risky choices for basic financial probability tasks and two health situations. For the health situations, participants had to choose between surgery or radiation therapy based on rates of survival and mortality. For all health choices across positive and negative moods, it was found that participants made more cautious decisions, compared to financial ones where they were more risky in their choices (Mohanty & Suar, 2014). For information processing, it was found that those who were primed into a negative mood used more fluency, originality and flexibility in making more cautious choices. These results highlight that not only mood but also the type of decision can have varying results on judgements and decision-making.

Suggestions have been made from previous examinations that positive moods promote information from the environment that “all is well”, whereas negative moods place a focus on information indicating that there are problems (Clore & Huntsinger, 2009; Schwarz & Clore, 1983). There is a distinct lack of research examining the potentially differing effects of a more rational or “cognitive” based mood in comparison to emotional-valenced ones. Utilising a word-search puzzle consisting of a 15×15 letter matrix in which participants searched for hidden words, van den Berg, Manstead, van der Pligt, and Wigboldus (2006) sought to examine if inducing either an affective or cognitive focus in their participants would impact attitude formation. Within the study, participants were presented with either positive or negative affective and cognitive information about a new attitude object.

The study found that in the affective focus condition, participants’ evaluations about the new attitude object were more in line with the valence of the affective
information than they were in the cognitive focus condition. Whereas evaluations made by participants in the cognitive focus condition were more consistent with the valence of the cognitive information. By measuring delayed memory, evaluation and response times of the new attitude object, it was found that affective focus also resulted in enhanced recall of the affective information and was associated with faster response times, suggesting easier and enhanced accessibility of affect-based attitudes compared to the cognitive-based ones (van den Berg et al., 2006).

Furthermore, van Gelder, de Vries, and van der Pligt (2009) induced either a cognitive- and affective-based processing mode in their participants using the same word search puzzle and examined both in relation to perceived risk and risky choice. They found that affective processing modes strengthen the relation between negative affect and risky choice, whereas cognitive processing strengths the relation between perceived risk and risky choice. Slovic et al. (2005) have also shown that the cognitive information processing mode is more sensitive to risk considerations (e.g., outcomes, probabilities), whereas the affective mode is more sensitive to aspects of the individual’s “affect pool”, which contains all the positive and negative tags consciously or unconsciously associated with the representations of phenomena.

It has been claimed that positive moods can promote more global, intuitive and holistic information processing by more attention being paid to uplifting messages, and in comparison, negative moods can promote systematic, narrow and analytic forms of processing by more attention to aversive, unpleasant aspects of the information (Das, Vonkeman, & Hartmann, 2012; Wegener, Smith, & Petty, 1995). Arising from such research, a core question emerges that has yet to be fully investigated: does rendering cognitive or affective information processing more salient when processing a health risk influence the evaluation of the perceived health risk?
3.1.2 Objective and hypotheses of pilot study

Given the lack of previous research examining the influence of primed dual processing modes for health risk perception, the current study sought to assess cognitive- and affective-based information processing modes in relation to a health risk. However, as the chosen method (e.g., word search puzzle) has not been examined in relation to such, a pilot study was conducted first to elucidate any potential methodological complications that may impact the effectiveness of the manipulation.

Based on the results of van Gelder et al. (2009) and van den Berg et al. (2006), the following hypotheses were tested:

Hypothesis 1: Participants in the affective group will report higher levels of affective information processing, measured by their scores from the Need for Affect (NFA; Maio & Esses, 2001), following completion of the word search puzzle.

Hypothesis 2: Participants in the cognitive group will report higher levels of cognitive information processing, measured by their scores on the Need for Cognition (NFC; Cacioppo, Petty, & Feng Kao, 1984), following completion of the word search puzzle.

It should be noted that given the low sample size of the pilot study, in assessing the effectiveness of the word search puzzles greater consideration will be given to descriptive statistics and participant responses on manipulation check questions, rather than the inferential statistical analyses.

3.2 Pilot Study

3.2.1 Method

3.2.1.1 Design

A short pilot study was conducted to assess the use of affective- and cognitive-based word search puzzles to prime affective and cognitive information processing
modes in participants. The pilot study utilised the same affective and cognitive word search puzzles as those of van Gelder et al. (2009). A between-subjects design was employed with participants randomly assigned to one of two groups: affective ($n = 6$) and cognitive ($n = 4$).

### 3.2.1.2 Participants

The population for the pilot study consisted of the student body of Trinity College Dublin (TCD). Following receipt of ethical approval (see Appendix A), recruitment and testing took place between March and April 2014, through an email campaign in a number of departments within the college. After receiving the invitation to participate, students were asked to contact the researcher if they were interested in taking part in the study. Upon contacting the researcher, participants were given a brief summary of the study and a testing time was arranged if participants expressed an interest. Junior and senior freshman on the undergraduate Psychology course received research credits for their participation. Other participants did not receive any incentive or reward for their participation.

### 3.2.1.3 Materials

The same affective- and cognitive-based word search puzzles as those employed by van Gelder et al. (2009) were utilised. Both word search puzzles comprised of a $15 \times 15$ letter matrix, and participants had to search for seven words (see Appendix B). Words could be hidden from top to bottom, from bottom to top, from left to right, from right to left or diagonally. Participants were given the following instructions, “Please find the words listed below in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have five minutes to find all seven words.” For the affective-based word search puzzle, participants had to find the following words: ‘feeling’, ‘emotion’, ‘sensation’, ‘state of

### 3.2.1.4 Measures

Four questionnaires were used for the pilot study. At the beginning of the testing session participants were asked to complete a short demographic questionnaire. The demographic characteristics assessed were age, gender, marital status, education level, and employment status (see Appendix C). Participants were asked to complete the Need For Affect (NFA; Maio & Esses, 2001) and the Need For Cognition (NFC; Cacioppo et al., 1984) scales before and after completing the word search puzzle. The NFA was included to examine individual differences in the motivation to approach or avoid emotions that may moderate the potential impact of the health risk information. The scale has been used in the past to understand reactions by participants to both emotional and cognitive messages (Appel, Gnambs, & Maio, 2012). While the NFC has been utilised to assess levels of effortful cognitive processing following a task Cacioppo et al., 1984). Participants were asked to indicate on a Likert scale of one to seven (one = strongly agree; seven = strongly disagree) to what extent they agreed or disagreed with each of the 26 statements at the present moment.

The questionnaire comprises two subscales, the need to approach and the need to avoid emotions. Both subscales of the NFA were found to be predominantly reliable through Cronbach’s alpha analysis: need to avoid emotions before completing the word search puzzle, $\alpha = .576$; need to avoid emotions after completing the word search puzzle, $\alpha = .764$; need to approach emotions before completing the word search puzzle, $\alpha = .899$; need to approach emotions after completing the word search puzzle, $\alpha = .929$. 
When examining all Cronbach’s alpha values stated above, consideration should be paid to the small sample size of the pilot study \((n = 10)\).

The NFC was included to examine individual differences in engaging in effortful cognitive processing before and after completing the word search puzzle. The NFC (Cacioppo et al., 1984) allows for an examination of individual differences in engaging in effortful cognitive processing that may moderate the potential impact of the health risk information. Participants were asked to indicate on a Likert scale of one to seven (one = strongly agree; seven = strongly disagree) to what extent they agreed or disagreed with each of the 18 statements at the present moment. The measure was found to be reliable before and after completing the word search puzzle, \(\alpha = .922\) and \(\alpha = .893\) respectively.

Additionally, participants were asked to complete a short manipulation check questionnaire consisting of three items, which was in line with previous research that suggested assessed the strength of cognitive and affective manipulations (Berndsen & van der Pligt, 2005; van den Berg et al., 2006; van Gelder et al., 2009). The first item asked participants to “make a list of the thoughts and feelings you had while completing the puzzle”. Secondly participants were asked to “indicate how you felt and what you thought while completing the study”. Finally, participants were asked if they had noticed “anything in particular about the puzzle”. All three items were open-ended.

### 3.2.1.4 Procedure

All testing sessions took place in testing rooms with the School of Psychology in TCD. At the beginning of the testing session, participants were welcomed and thanked for their interest. Participants were informed of the nature of the study and reminded that they could withdraw from the study at any stage if they so wished. Participants were then asked to complete the consent form (see Appendix D) if they
were happy to procedure with participation and asked if they had any questions before beginning the testing session. Following this, participants were asked to complete the short demographic questionnaire.

Participants were then asked to complete the NFC and the NFA. After participants had indicated that they had finished completing the measures, they were presented with an affective- or cognitive-based word search puzzle and given instructions for its completion. Participants were informed that they would be timed using a stopwatch and asked if they were comfortable with this. Once participants had indicated they were happy to continue, the five minutes to complete the word search puzzle began.

After the five minutes had elapsed or participants had found all seven words, participants were asked to stop working on the word search puzzle and were asked to complete a battery of questionnaires, which included the NFC, the NFA and the manipulation check questionnaire. Once participants have completed all questionnaires, they were debriefed, thanked for their participation, and asked if they have any further questions relating to the study.

3.2.2 Results

3.2.2.1 Sample characteristics

12 participants contacted the researcher and 10 participants took part in the study and completed each section. Two participants were lost as they were no longer contactable or they declined to participate while a testing session was being arranged. Participants were randomly allocated, using the random number generation function in Excel, to one of two groups: affective (n = 6) and cognitive (n = 4) information processing mode. Demographic information for the 10 participants is presented in Table 3.1, with the data split across the two groups.
Within the whole sample, there were two males and eight females and the mean age was 24.80 years \((SD = 3.19; 95\% CI: 17.59, 32.01)\). Eight participants identified themselves as Irish, while two participants were non-Irish. Eight participants were single, with one participant married, and one living with partner as if married. Seven participants had completed up to secondary level education, while three participants had completed some form of third level education. Eight participants stated that they were full-time students, while one stated that they were full-time employed, and one participant indicated that they were part-time employed.

Table 3.1

**Demographic characteristics for sample**

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Affective ((n = 6))</th>
<th>Cognitive ((n = 4))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n (%))</td>
<td>(M (SD; 95% CI))</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21.33 (3.45; 17.72, 24.95)</td>
<td>30.00 (7.49; 6.15, 53.85)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2 (33.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td>4 (66.7%)</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>Nationality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irish</td>
<td>5 (83.3%)</td>
<td>3 (75%)</td>
</tr>
<tr>
<td>Non-Irish</td>
<td>1 (16.7%)</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>5 (53.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Living with partner as if married</td>
<td>1 (16.7%)</td>
<td>3 (75%)</td>
</tr>
<tr>
<td>Married</td>
<td>-</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>Education Completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary level</td>
<td>4 (66.7%)</td>
<td>3 (75%)</td>
</tr>
<tr>
<td>Third level</td>
<td>2 (33.3%)</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>Employment Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>6 (100%)</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>Full-time</td>
<td>-</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>Part-time</td>
<td>-</td>
<td>1 (25%)</td>
</tr>
</tbody>
</table>
3.2.2.2 Descriptive statistics

Descriptive statistics for the NFC and the NFA pre-completion and post-completion of the word search puzzle are presented in Table 3.2 and Table 3.3 respectively, with the data split across the two groups.

Table 3.2

Descriptive statistics for the NFA and NFC pre-word search puzzle (Time 1)

<table>
<thead>
<tr>
<th>Measures</th>
<th>Affective (n = 6)</th>
<th>Cognitive (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>NFA</td>
<td>26.32</td>
<td>21.61</td>
</tr>
<tr>
<td>Need to avoid</td>
<td>-11.50</td>
<td>10.21</td>
</tr>
<tr>
<td>Need to approach</td>
<td>14.67</td>
<td>14.54</td>
</tr>
<tr>
<td>NFC</td>
<td>21.33</td>
<td>16.96</td>
</tr>
</tbody>
</table>

Table 3.3

Descriptive statistics for the NFA and NFC post-word search puzzle (Time 2)

<table>
<thead>
<tr>
<th>Measures</th>
<th>Affective (n = 6)</th>
<th>Cognitive (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>NFA</td>
<td>24.83</td>
<td>20.51</td>
</tr>
<tr>
<td>Need to approach</td>
<td>11.00</td>
<td>12.52</td>
</tr>
<tr>
<td>NFC</td>
<td>21.67</td>
<td>15.24</td>
</tr>
</tbody>
</table>

3.2.2.3 Differences between information processing groups

Exploratory 2×2 mixed ANOVAs were completed to examine if any differences existed between the two groups (affective and cognitive) in their NFA and NFC scores before and after completing the word search puzzles. The within-subjects factor tested had two levels (pre-word search puzzle and post word-search puzzle), and the between-subjects factor was the information-processing group, which also had two levels (affective or cognitive).

The analysis was completed as a preliminary check of the word search puzzles. The small numbers for the analysis are acknowledged and will be taken into
consideration when interpreting the results (see section 3.2.3). Furthermore, attention is
drawn to the descriptive statistics for each group pre- and post-completion of the word
search puzzle.

For cognitive processing, no significant main effect was noted from before to
after completion of the word search puzzle, $F(1, 8) = 0.52, p = .493$, partial $\eta^2 = .06$.
NFC scores were slightly higher before the word search puzzle ($M = 22.20, SD = 15.61,$
95% CI = 11.03, 33.37) compared to after ($M = 21.00, SD = 15.16, 95% CI = 10.15,$
31.85). There was no significant main effect for the different information processing
groups, $F(1, 8) = 0.001, p = .981$, partial $\eta^2 < .01$. Participants in the affective condition
showed very little difference in their NFC scores; pre word-search puzzle ($M = 21.33$, 
$SD = 16.95, 95% CI = 3.54, 39.14$), post word-search puzzle ($M = 21.67, SD = 15.24,$
95% CI = 5.67, 37.66). Those in the cognitive group did show a decrease in their NFC
score; pre word-search puzzle ($M = 23.50, SD = 15.75, 95% CI = -1.58, 48.58$), post
word-search puzzle ($M = 20.00, SD = 17.34, 95% CI = -7.59, 47.59$). There was no
significant interaction between the variables, $F(1, 8) = 0.76, p = .409$, partial $\eta^2 = .41$
(see Figure 3.1).

For affective processing, no significant main effect was found from before to
after completion of the word search puzzle, $F(1, 8) = 0.00, p = .985$, partial $\eta^2 < .01$.
There was little difference in NFA scores before completion of the word search puzzle
($M = 25.50, SD = 17.79, 95% CI = 12.77, 38.23$) compared to after ($M = 25.30, SD =$
19.91, 95% CI = 11.06, 39.54). Furthermore, there was no significant main effect for
the different information processing groups, $F(1, 8) = 0.00, p = .984$, partial $\eta^2 < .01$.
For the affective group, there was a slight decrease in NFA scores after completion of
the word search puzzle; pre word-search puzzle ($M = 26.17, SD = 21.60, 95% CI =$
3.49, 48.84), post word- search puzzle ($M = 24.83, SD = 20.50, 95% CI = 3.31, 46.35$).
Figure 3.1. NFC scores before and after completion of the word search puzzle by both information-processing groups. Note. Error bars are based on within-groups standard error.¹

For the cognitive group, there was a slight increase in NFA scores after completion of the word search puzzle; pre word-search puzzle ($M = 24.50, SD = 13.00, 95\% CI = 3.81, 45.19$), post word-search puzzle ($M = 26.00, SD = 22.06, 95\% CI = -7.59, 47.59$). There was no significant interaction between the variables, $F(1, 8) = 0.11, p = .750$, partial $\eta^2 < .01$ (see Figure 3.2).

3.2.2.4 Manipulation check

For the first two manipulation check items ('Can you make a list of the thoughts and feelings you had while completing the puzzle?' and ‘Can you indicate how you felt and what you thought while completing the study?'), there were no notable differences between the groups. For the first item, participants from both groups commented on feeling determined to complete the word search puzzle, with comments such as “Motivated”, “Determined to find the words as quick as possible” and “Thinking ‘focus’”. One participant from each group mentioned feeling pressured because of the

¹Error bars were calculated based on the within-subjects standard error according to the method of O’Brien and Cousineau (2014).
time and that they “had to finish it”. For the second item, again participants from both groups expressed the desire to do well and “wanting to succeed”.

![Figure 3.2](image)

Figure 3.2. NFA scores before and after completion of the word search puzzle by both information-processing groups. Note. Error bars are based on within-groups standard error.

The most salient result from the manipulation check questions came from item three (‘Did you notice anything in particular about the puzzle?’). All four participants from the cognitive group, identified and noted that the seven words included in the task were related to “thinking” or the “mind”. Additionally, within the affective group, four participants noted that the seven words included in the task were either related to “emotions” or “emotional aspects”. The other two participants noted that the seven words were similar or “were in same general area”.

### 3.2.3 Discussion

From the pilot study, no major differences from the quantitative analyses were noted between the groups or before and after completing the word search puzzles, and no evidence was found to support hypotheses one and two. This is not surprising due to the low numbers for the analyses. Slight changes in participants’ scores for the NFC
and NFA are noted pre and post completion of the word search puzzle. For those in the affective salient group, scores on the NFA decreased after completing the word search puzzle, however NFC scores remained very similar. For the cognitive group, NFA scores after completion of the word search puzzle increased, and scores on the NFC had decreased. Neither result fully supporting the manipulation; however, suggesting further examinations may be warranted. When examining the results from the analyses due to the small numbers for the quantitative analyses, greater consideration was given to participants’ answers from the open-ended questions assessing the manipulations. All participants irrespective of which group they were randomly assigned to, noted the general theme of the search words within both word search puzzles. Due to such results, study one continued with the word search puzzle as part of the information processing manipulation. A number of changes were made to the word search puzzles, along with additions to the overall manipulation, in order to increase the salience of the manipulations.

Instead of one affective-based word search puzzle, two affective word search puzzles were included, one with positive affective words and a second with negative affective words. This was in line with previous research examining affective manipulations (Cardi, Leppanen, & Treasure, 2015; Gardner, 1985; Gilet, 2008; Västfjäll, 2001), the large majority of which utilise a dichotomy of such, either positively or negatively salient, rather than one general affective salient manipulation. Previous research has shown that separate positive and affective based incidental manipulations can be effective at producing varying results in risk perceptions: positive manipulations result in more optimistic likelihood estimates, whereas negative manipulations can produce more pessimistic estimates (Waters, 2008). The body of literature on separate affective incidental manipulations is greater than that of singular
affective manipulations (Cardi et al., 2015; Gardner, 1985; Gilet, 2008; Västfjäll, 2001), and therefore, the manipulations in study one were conducted in line with such.

All participants in the pilot study recognised that the words included in the word search puzzle were either cognitive or affective based. This obvious nature of the manipulation was deemed problematic. If participants were obviously aware of the type of manipulation included in the word search puzzles, it may have affected the effectiveness of the manipulation. To try and counteract this, additional neutral words were included in the word search puzzles for study one. Furthermore, along with neutral words, extra positive and negative affective words were included. Including more neutral and non-neutral words increased the length of the word search puzzles and the amount of time participants would spend working on the task. This may increase the effectiveness of the task as participants would be spending greater amounts of time processing the information. Due to the comments from participants in the pilot study about feeling “pressured” and because of the inclusion of additional words, the time limit for the word search puzzles was also increased. Furthermore, to aid with priming, image-based manipulations were included in addition to the word search puzzles (for a detailed description of the word search puzzles used in study one, see section 3.3.3).

As discussed in section 3.1.1, from various psychological disciplines an array of methods can be utilised in order to prime dual information processing modes (Froeliger et al., 2012; Kienast et al., 2008; Melcher et al., 2011; van Holst et al., 2012). Given a number of concerns raised over the direct and indirect influences of such methods for producing cognitive and affective salient modes, a lack of clarity over methodological features and uncertainty over the underlying cognitive processes (Dobson & Dozois, 2004; Fabrigar & Petty, 1999; See, Petty, & Fabrigar, 2013), the current study chose an image-based manipulation as a compliment to the word search puzzles in order to
increase their effectiveness for producing cognitive and affective salient information processing modes. Additionally, a number of other methods require participants to partake in tasks that require numerical skills, as well as other decision-making and judgement processes (e.g., Stroop task, emotional oddball task).

The overall objective of the current thesis was to examine dual information processing in terms of CVD risk information, and the aim of study one was to examine an incidental manipulation of such, hence why the word search puzzles were initially chosen as suitable tasks. Word search puzzles in both forms of the manipulation (affective and cognitive) would require participants to process the information presented in the task, and this would be consistent across all forms of the manipulation. Other tasks such as an emotional Stroop (affective manipulation) or probability based questions (cognitive manipulation) were not chosen as the overall manipulation (information processing) could not be maintained across all three groups (positive affective, negative affective, cognitive). It could not be assured that an emotional Stroop task and probability based questions were manipulating equivalent information processes across the groups. Due to the results of the pilot study and in line with the above considerations for consistency in manipulating information processing, an image-based manipulation would require participants to pay attention to the displayed images (Gerrards-Hesse et al., 1994; Portnoy, Ferrer, et al., 2014; Waters, 2008), but would not place a large amount of demand on other decision-making processes that may influence their health risk perceptions.

3.2.3.1 Objective and hypotheses of study one

Study one examined cognitive- and affective-based information processing modes in related to a health risk. The aim of study one was to examine how cognitive- and affective-based information processing modes influence CVD risk perception. The
study used a combined manipulation of images and a word search puzzle to prime a positive-affective, negative-affective or cognitive salient information-processing mode.

Similar to the pilot study and in line with the results of van Gelder et al. (2009) and van den Berg et al. (2006), the first two hypotheses in terms of information processing were tested:

Hypothesis 1: Participants within the affective salient information processing modes would report higher affective information processing, measured by their scores from the NFA (Maio & Esses, 2001) and the PANAS-X (Watson & Clark, 1991), than those in the cognitive salient information-processing mode.

Hypothesis 2: Participants within the cognitive salient information-processing mode would report higher cognitive information processing, measured by their scores on the NFC (Cacioppo et al., 1984) and the Rational-Experiential Inventory (REI-40; Pacini & Epstein, 1999), than those in the affective salient information-processing modes.

Following on from the first two hypotheses, in terms of risk perception and behavioural intentions hypotheses three and four were also tested:

Hypothesis 3: Building on the work of van Gelder et al. (2009) and van den Berg et al. (2006), it is expected that participants within the cognitive salient information-processing mode would perceive less of a risk of CVD compared to those in the affective salient information processing modes (3a). Furthermore, in accordance with Waters (2008), the positive-affective salient information-processing mode would perceive less of a risk of CVD than those in the negative-affective salient information-processing mode (3b).

Hypothesis 4: As discussed in sections 2.2.1 and 2.3, and in line with the results of Chen et al. (2011) and Janssen et al. (2012), it is expected that those in the affective
salient information-processing modes will report higher intentions for future behaviours related to monitoring and testing for CVD, compared to those in the cognitive salient information-processing mode.

3.3 Method

3.3.1 Design

A between-subjects design was employed with participants randomly assigned to one of three groups: a positive-affective \((n = 16)\), a negative-affective \((n = 17)\) or a cognitive \((n = 18)\) salient information-processing mode. Participants were asked to attend to a set of positive-affective, negative-affective or cognitive based images and to complete either a positive-affective, negative-affective or cognitive based word search puzzle in order to induce the relative information processing mode. Participants were then presented with information regarding CVD risk and asked to complete a battery of self-report questionnaires to measure both information processing modes (cognitive and affective), affective reactivity and risk perception. The study was approved by the ethics committee in the School of Psychology, TCD (see Appendix A).

3.3.2 Participants

3.3.2.1 Eligibility criteria

Three eligibility criteria were set for the study: participants had to be 18 years of age or older, capable of giving consent to participate and have a good standard of English.

3.3.2.2 Recruitment

The population for this study consisted of the student body of TCD. Recruitment and testing took place between September and December 2014, through an email campaign in a number of departments within the college. An a priori power calculation using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) revealed that for ANOVA
with three groups to detect a large effect size, as being significant at the .05 level, a sample of 23 participants per group will need to be recruited. Upon contacting the researcher, participants were given a brief summary of the study and a testing time was arranged. Junior and senior freshman on the undergraduate Psychology course received research credits for their participation. Other participants did not receive any incentive or reward for their participation.

3.3.3 Materials

3.3.3.1 Images

For the image-based section of the manipulation for both affective groups, positive and negative images were chosen from the IAPS (Lang, Bradley, & Cuthbert, 2008). The IAPS (Lang et al., 2008) comprises of a large, standardised set of emotionally evocative, internationally accessible, colour photographs that have been assessed for valence (pleasant/unpleasant), arousal (calm/excited) and dominance (controlled/uncontrolled). Images from the IAPS have been rated on a nine-point scale, where nine represents a high rating on each dimension (i.e., high pleasure, high arousal, high dominance), and one represents a low rating on each dimension (i.e., low pleasure, low arousal, low dominance). For the IAPS, 50 positive and negative images were chosen to be displayed to participants in the positive-affective and negative-affective groups (see Appendix E for IAPS picture details).

No extremely negative or positive images were selected (positive $M_{Val} = 7.79$, negative $M_{Val} = 2.73$) and the images were matched for arousal across the positive and negative sets. An independent samples t-test was conducted to evaluate if there was a significant difference in arousal levels between the 50 positive and 50 negative images selected from the IAPS (Lang et al., 2008). The images were rated on a nine-point scale for level of arousal (nine = high arousal and one = low arousal). The results showed that
there was no significant difference between the positive ($M = 5.33$, $SD = 0.78$; 95% CI: 5.11, 5.56) and negative ($M = 5.58$, $SD = 0.75$; 95% CI: 5.37, 5.80) images for arousal ratings, $t(98) = -1.630$, $p = .106$, two-tailed.

For the cognitive-based information processing mode, four images from the IAPS (Lang et al., 2008) depicting individuals reading, completing a puzzle and playing chess were chosen (see Appendix E). These images had been rated as neutral for valence ($M = 5.30$) and had a low average arousal rating ($M = 3.10$). As the IAPS are a set of emotionally evocative images, images for the cognitive-based manipulation needed to be sourced from elsewhere. Therefore, 35 images from the SUN2012 (Xiao, Hays, Ehinger, Oliva, & Torralba, 2010) were selected. The SUN2012 database (Xiao et al., 2010) provided by the Princeton Vision Group is a large set of environmental scenes, places and objects that can be utilised in research examining human scene classification performance. The images selected for the purpose of this study depicted lecture rooms, classrooms, reading rooms, libraries, study halls and labs (see Appendix E for further details). In addition, included within the cognitive set of images were 11 images depicting chessboards, crossword puzzles and Sudoku games that were obtained from public sources on the Internet (see Appendix E for details). These images were chosen, as they were similar in nature to the initial four selected from the IAPS (Lang et al., 2008) images depicting chess and a puzzle. The image sets for all three groups were displayed for participants using Microsoft Office PowerPoint on a Dell Latitude E6330 laptop and a Dell E173FP 17-inch Flat Panel Display.

3.3.3.2 Word search puzzles

In order to aid with inducing a positive-affective, negative-affective or cognitive based information processing mood, participants were additionally asked to complete either a positive-affective, negative-affective or cognitive based word search puzzle
depending on which group they had been randomly allocated to. All three word search puzzles were generated using the Puzzlemaker provided by Discovery Education (http://www.discoveryeducation.com/freepuzzlemaker/?CFID=6548563&CFTOKEN=32590212).

Each word search puzzle comprised of 15 non-neutral (either positive, negative or cognitive) words and 15 neutral words within a 30×30 letter matrix (see Appendix F). Words could be hidden from top to bottom, from bottom to top, from left to right, from right to left or diagonally. The 30 words that had to be found by participants were listed below the puzzle. For the positive and negative affective word search puzzles, 15 positive and negative words were selected from the ANEW (Bradley & Lang, 2010). The ANEW provides normative emotional ratings (valence, arousal and dominance) for a large set of English words and has been completed by the same researchers who developed the IAPS (Lang et al., 2008). In the positive-affective condition, participants searched for the following positive words: ‘ecstatic’, ‘enjoy’, ‘enthusiastic’, ‘fun’, ‘funny’, ‘happy’, ‘joy’, ‘kiss’, ‘laughter’, ‘love’, ‘passion’, ‘romantic’, ‘success’, ‘thrill’, and ‘victory’ \((M\ Val = 8.32)\); as well as the following neutral words: ‘store’, ‘bridge’, ‘highway’, ‘zipper’, ‘job’, ‘arrow’, ‘soccer’, ‘skyscraper’, ‘bolt’, ‘ticket’, ‘jungle’, ‘airport’, ‘hockey’, ‘news’, and ‘country’. The neutral words were chosen as they had been rated as neutral in valence \((M = 5.63)\) and arousal \((M = 5.39)\) within the ANEW (Bradley & Lang, 2010).

In the negative-affective word search puzzle, participants searched for the same 15 neutral words as utilised in the positive affective word search puzzle and the following negative words: ‘betray’, ‘terrified’, ‘disaster’, ‘tragedy’, ‘fail’, ‘abuse’, ‘humiliation’, ‘nightmare’, ‘furious’, ‘afraid’, ‘assault’, ‘war’, ‘stress’, ‘hate’, and ‘shame’ \((M\ Val = 1.91)\). As with the selected images, an independent samples t-test was
conducted to evaluate if there was a significant difference in arousal levels between the 15 positive and 15 negative words selected from the ANEW (Bradley & Lang, 2010). The words were rated on a nine-point scale for level of arousal. Ratings were scored such that nine represented a high rating (i.e., high arousal), and one represented a low rating (i.e., low arousal). The results showed that there was no significant difference between the positive ($M = 7.03, SD = 0.55; 95\% CI: 6.72, 7.34$) and negative ($M = 7.02, SD = 0.56; 95\% CI: 6.72, 7.34$) words for arousal ratings, $t(28) = 0.020, p = .984$, two-tailed.

In the cognitive condition, participants searched for the same 15 neutral ANEW (Bradley & Lang, 2008) words as utilised in both affective conditions, as well as the following cognitive words: ‘analysing’, ‘examine’, ‘comprehend’, ‘inspect’, ‘investigate’, ‘study’, ‘fact’, ‘knowing’, ‘intellect’, ‘logic’, ‘thinking’, ‘pensive’, ‘mind’, ‘rational’, and ‘reasoning’. The cognitive words were selected from previous research utilising the same word search puzzle task (van den Berg et al., 2006; van Gelder et al., 2009), and through the Edinburgh Associative Thesaurus (EAT) based within the MRC Psycholinguistic Database (Wilson, 1988). Seven cognitive words were taken from previous research: ‘analysing’, ‘knowing’, ‘logic’, ‘mind’, ‘rational’, ‘reasoning’ and ‘thinking’ (van den Berg et al., 2006; van Gelder et al., 2009). After completion of the pilot study, the decision was made to include more cognitive words so that there was an equal number of non-neutral words across all three word search puzzles (positive-affective, negative-affective and cognitive).

The MRC Psycholinguistic Database (Wilson, 1988) is a large dictionary (150,837 words) containing both linguistic (e.g., spelling, syntactic category, and number of letters) and psycholinguistic (e.g., concreteness, familiarity, meaningfulness) information for words, and can be used for compiling psychological and linguistically
stimuli for experiments. Contained within the MRC Psycholinguistic Database (Wilson, 1988) is the EAT, which can be used to provide semantic linking between words, as the thesaurus contains sets of word association norms and count frequency for such words. After searches within the EAT for the initial seven cognitive words used in the pilot, eight words were selected for inclusion in the cognitive word search puzzle due to their similarity in meaning to the initial seven cognitive words: ‘examine’, ‘comprehend’, ‘inspect’, ‘investigate’, ‘study’, ‘fact’, ‘intellect’, and ‘pensive’.

3.3.3.3 CVD risk information

Information pertaining to CVD risk was utilised within study one for the health risk (see Appendix G). The risk information used was gathered from http://ihda.ie/, http://www.irishheart.ie, http://www.nhs.uk/Conditions/Coronary-heart-disease/, and the ‘Changing Cardiovascular Health: National Cardiovascular Health Policy 2010 – 2019’ published by the Department of Health and Children (2010). Information detailing the number of deaths in Ireland due to CVD in 2008, risk factors (e.g., smoking, diet, exercise, alcohol consumption) associated with CVD, and the prevalence of such risk factors in Ireland were included.

3.3.4 Measures

Six questionnaires were used throughout study one. One demographic, medical history and health behaviour questionnaire at the beginning of the testing session and then a battery of five questionnaires to assess information processing, affective reactivity and risk perception after the manipulation.

3.3.4.1 Demographic characteristics

At the beginning of the testing session, participants completed a demographics and health questionnaire (see Appendix H). The demographic characteristics assessed were age, gender, nationality, marital status, level of education and employment status.
3.3.4.2 Medical history

Questions relating to personal and family medical history were included to allow such information to be controlled for if participants had extensive personal and/or family history of CVD that would potentially impact their perception of CVD risk. Participants were asked to indicate if they had a personal and family history of CVD. Furthermore, they were asked if they had any other on-going medical problems and if they had ever been diagnosed with depression or an anxiety disorder.

3.3.4.3 Health behaviours

On the demographics and health questionnaire, participants were also asked to provide information pertaining to their exercise, diet, alcohol intake and smoking behaviours. Participants self-reported their health and weight, and were asked to indicate their eating habits from a list of four options. Furthermore, they were asked to indicate in accordance with the guidelines for exercise and alcohol consumption, their weekly level of exercise and alcohol consumption. The last item asked participants to indicate if they were a current smoker, ex-smoker or never smoked. This was due to their association with CVD and the inclusion of such information within the CVD risk messages presented to participants as part of the study.

3.3.4.4 Need for Affect

The NFA (Maio & Esses, 2001) examines individual differences in the motivation to approach or avoid emotions that may influence the potential impact of the health risk information. Both subscales were found to be reliable through Cronbach’s alpha analysis for this sample: need to approach emotions, $\alpha = .736$ and need to avoid emotions, $\alpha = .823$. The overall score for the need to avoid emotions is subtracted from that of the overall score for the need to approach emotions to give the need for affect score.
3.3.4.5 Need for Cognition

The NFC (Cacioppo et al., 1984) examines individual differences in engaging in effortful cognitive processing that may moderate the potential impact of the health risk information. Internal consistency for the current sample was good ($\alpha = .847$). The overall score is calculated from 18 items scored on seven-point Likert scales.

3.3.4.6 PANAS-X

The expanded Positive and Negative Affect Scale (PANAS-X; Watson & Clark, 1991) sought to access individual differences in affective reactivity. Participants were asked to indicate to what extent they felt each of the 60 emotions listed right now (i.e., at the present moment), on a Likert scale of one to five (one = very slightly or not at all; five = extremely). Participants’ responses to the individual items are summed together to generate scores for various subscales included in the PANAS-X. All subscales were found to be reliable for this sample: general negative affect (ten items, $\alpha = .792$), fear (six items, $\alpha = .818$), sadness (five items, $\alpha = .860$), guilt (six items, $\alpha = .875$), hostility (six items, $\alpha = .679$), shyness (four items, $\alpha = .816$), fatigue (four items, $\alpha = .852$), general positive affect (ten items, $\alpha = .880$), joviality (eight items, $\alpha = .938$), self-assurance (six items, $\alpha = .831$), attentiveness (four items, $\alpha = .697$), serenity (three items, $\alpha = .761$), and surprise (three items, $\alpha = .838$).

3.3.4.7 REI-40

The Rational-Experiential Inventory (REI-40; Pacini & Epstein, 1999) was included to measure the extent to which participants relied on both processing modes (cognitive and affective), and as a measure is useful for examining receptivity to different kinds of communication. Participants were asked to indicate on a Likert scale of one to five (one = completely true; five = completely false) to what extent each of the 40 statements were true or false for them. The questionnaire comprises four subscales,
each consisting of 10 items, all of which were found to have good internal consistency for this sample: rational ability ($\alpha = .800$), rational engagement ($\alpha = .878$), experiential ability ($\alpha = .858$), and experiential engagement ($\alpha = .863$).

### 3.3.4.8 Risk perception

The final questionnaire asked participants to answer 13 questions designed to measure their risk perception. Specific measures for the following aspects of risk perception were included: perceived personal susceptibility, perceived comparative susceptibility, perceived personal severity, worry and anxiety about CVD, response efficacy, self-efficacy, future intentions with regard CVD and their understanding of the health risk information (see Appendix I). Items were chosen in order to assess the general concepts associated with risk perception (e.g., perceived personal risk, comparative risk, perceived anxiety) that are in line with Slovic’s risk-as-analysis versus risk-as-feelings theory (Slovic et al., 2004; Slovic et al., 2005), as discussed at the beginning of section 2.2 and above in section 3.1.1. As the health message contained information pertaining to CVD associated health behaviours a number of measures were included to assess perceptions of efficacy (e.g., self-efficacy, general efficacy, willingness to take future action). Lastly, items were included to examine participants’ reported understanding of the risk information (e.g., confidence in understanding, satisfaction with the amount of information). These items were based on those of previous research (Brewer et al., 2007; Conner & Norman, 1995; Strecher, McEvoy DeVellis, Becker, & Rosenstock, 1986; Waters, 2008).

All questions utilised seven-point Likert scales. Perceived personal susceptibility, comparative susceptibility, perceived severity, worry and anxiety were all measured with one item (one = not at all; seven = Very likely). Perceived efficacy and self-efficacy were measures with four items (one = not at all; seven = very
willing/Definitely). Participants were also asked to indicate how likely they would be to pay attention to symptoms of CVD in the future using one item (one = not at all likely; seven = very likely). Participants understanding and assessment of the CVD risk message was assessed using three items (clarity of information; confidence in understanding; satisfaction with level of information; one = not all clear/confident/satisfied, seven = very clear/confident/satisfied).

3.3.5 Procedure

All testing sessions took place in testing rooms with the School of Psychology in TCD. At the beginning of the testing session, participants were welcomed and thanked for their interest in taking part in the study. Participants were first asked to read the information sheet (see Appendix J), they were informed of the nature of the study and reminded that they could withdraw from the study at any stage if they so wished. After reading the information sheet, participants were asked to complete the consent form (see Appendix D) if they were happy to procedure with participation and asked if they had any questions before beginning the testing session. Following this, participants were asked to complete the demographics and health questionnaire. It was stated to participants that the questionnaire contained questions relating to their health, and if they wished not to answer such questions, they were not obliged to.

After completion of the demographics and health questionnaire, participants were directed towards the external monitor, which displayed the following message, ‘Please view and pay attention to the following images’. Participants were asked to pay attention to the set of images that were going to appear on the screen and were reminded that if they wanted to stop participation at any stage they were free to do so. Each image was displayed for six seconds (in line with IAPS procedures; Lang et al., 2008), with a half a second break in between each image (where a black fixation cross
was displayed in the middle of a white screen), resulting in each set of images lasting five minutes and 42 seconds.

Following this, participants were presented with a positive affective, negative affective or cognitive word search puzzle (in line with which set of images they had just viewed) across two pages, one page containing the word search puzzle and the second containing the listed of 30 words that had to be found within the word search puzzle. Participants were given the following instruction, ‘Please find the words listed on the next page in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have 10 minutes to find all 30 words’. Participants were informed that they would be timed using a stopwatch and asked if they were comfortable with this. Once participants had indicated they were happy to continue, the 10 minutes to complete the word search puzzle began.

After the 10 minutes had elapsed, participants were asked to stop working on the word search puzzle and were presented with the CVD risk message. They were asked to read the CVD risk message presented on the page and informed that they would be asked to complete a questionnaire afterwards based on the CVD risk message. After participants had indicated that they had finished reading the CVD risk information, they were presented with the battery of questionnaires to be completed. Participants were informed that the instructions for each questionnaire were included at the top of each questionnaire, but if they had any questions to ask the researcher. Once participants have completed all questionnaires, they were debriefed (see Appendix J), thanked for their participation, and asked if they have any further questions relating to the study.

3.3.6 Analysis

Data were analysed with IBM SPSS Statistics (v. 23). Frequency information and descriptive statistics (M, SD and 95% confidence intervals) were appropriate are
presented for sample characteristics and outcome measures. One-way between-groups ANOVAs were conducted. The alpha level for significance was set at the standard .05. Any results falling within the range of .05 to .10 were considered as trends. Where measures were deemed to be assessing similar constructs, corrections for were made for multiple comparisons. Where corrections for multiple comparisons were conducted, the procedure and new alpha value is identified for the relevant analysis.

3.4 Results

3.4.1 Sample characteristics

In total, 57 participants contacted the researcher and 51 participants took part in the study and completed each section. Six participants were lost as they were no longer contactable or they declined to participate while a testing session was being arranged. Participants were randomly allocated to one of three information processing groups: 1) positive affective information processing ($n = 16$); 2) negative affective information processing ($n = 17$); and 3) cognitive information processing ($n = 18$). Demographic characteristics and health information for the sample are summarised in Table 3.4 and 3.5, with data split across the three information-processing groups. Within the whole sample, there were 15 (29.4%) males and 36 (70.6%) females and the mean age was 20.60 ($SD = 4.79$; 95% CI = 19.24, 21.96). The majority of the sample identified themselves as Irish: Irish = 42 (8.4%); Non-Irish = 9 (17.6%). 50 (98%) participants were single, with 1 (2%) participant married. In terms of education, 46 (90.2%) participants had completed up to secondary level education, while 5 (9.8%) participants had completed some form of third level education. 41 (80.4%) participants stated that they were full-time students, while 10 (19.6%) stated that they were full-time students and working part-time. Therefore, 100% of the sample were full-time students.
Table 3.4

Demographic characteristics for sample

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Positive Affective (n = 16)</th>
<th>Negative Affective (n = 17)</th>
<th>Cognitive (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>M (SD; 95% CI)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Age</td>
<td>19.44 (1.75; 18.50, 20.37)</td>
<td>23.59 (7.18; 19.90, 27.28)</td>
<td>18.71 (1.11; 18.14, 19.27)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5 (31.3%)</td>
<td>6 (35.3%)</td>
<td>4 (22.2%)</td>
</tr>
<tr>
<td>Female</td>
<td>11 (68.8%)</td>
<td>11 (64.7%)</td>
<td>14 (77.8%)</td>
</tr>
<tr>
<td>Nationality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irish</td>
<td>15 (93.8%)</td>
<td>15 (88.2%)</td>
<td>12 (66.7%)</td>
</tr>
<tr>
<td>Non-Irish</td>
<td>1 (6.3%)</td>
<td>2 (11.8%)</td>
<td>6 (33.3%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>15 (93.8%)</td>
<td>17 (100%)</td>
<td>18 (100%)</td>
</tr>
<tr>
<td>Married</td>
<td>1 (6.3%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Education Completed</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Secondary level</td>
<td>14 (87.5%)</td>
<td>14 (82.4%)</td>
<td>18 (100%)</td>
</tr>
<tr>
<td>Third level</td>
<td>2 (12.5%)</td>
<td>3 (17.6%)</td>
<td>-</td>
</tr>
<tr>
<td>Employed Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>11 (68.8%)</td>
<td>14 (82.4%)</td>
<td>16 (88.9%)</td>
</tr>
<tr>
<td>Student + working part-time</td>
<td>5 (31.3%)</td>
<td>3 (17.6%)</td>
<td>2 (11.1%)</td>
</tr>
</tbody>
</table>
### Table 3.5

**Health information for sample**

<table>
<thead>
<tr>
<th>Health Information</th>
<th>Positive Affective (n = 16)</th>
<th>Negative Affective (n = 17)</th>
<th>Cognitive (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n (%))</td>
<td>(n (%))</td>
<td>(n (%))</td>
</tr>
<tr>
<td><strong>CVD: Personal History</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16 (100%)</td>
<td>17 (100%)</td>
<td>18 (100%)</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CVD: Family History</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (25%)</td>
<td>4 (23.5%)</td>
<td>1 (5.6%)</td>
</tr>
<tr>
<td>No</td>
<td>12 (75%)</td>
<td>13 (76.5%)</td>
<td>17 (94.4%)</td>
</tr>
<tr>
<td><strong>On-going Health Issues</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 (6.3%)</td>
<td>1 (5.9%)</td>
<td>4 (22.2%)</td>
</tr>
<tr>
<td>No</td>
<td>15 (93.8%)</td>
<td>16 (94.1%)</td>
<td>14 (77.8%)</td>
</tr>
<tr>
<td><strong>Depression/Anxiety(^a)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 (31.3%)</td>
<td>2 (11.8%)</td>
<td>3 (16.7%)</td>
</tr>
<tr>
<td>No</td>
<td>11 (68.8%)</td>
<td>15 (88.2%)</td>
<td>15 (83.3%)</td>
</tr>
<tr>
<td><strong>Eating Habits(^a)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t pay attention</td>
<td>2 (12.5%)</td>
<td>3 (17.6%)</td>
<td>1 (5.6%)</td>
</tr>
<tr>
<td>Healthy diet…feel guilty</td>
<td>1 (6.3%)</td>
<td>3 (17.6%)</td>
<td>6 (33.3%)</td>
</tr>
<tr>
<td>Usually watch what I eat</td>
<td>11 (68.8%)</td>
<td>9 (52.9%)</td>
<td>9 (50%)</td>
</tr>
<tr>
<td>Always watch what I eat</td>
<td>2 (12.5%)</td>
<td>2 (11.8%)</td>
<td>2 (11.1%)</td>
</tr>
<tr>
<td><strong>Exercise(^a)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For the suggested amount</td>
<td>3 (18.8%)</td>
<td>4 (23.5%)</td>
<td>5 (27.8%)</td>
</tr>
<tr>
<td>Less than the suggested…</td>
<td>5 (31.3%)</td>
<td>6 (35.3%)</td>
<td>4 (22.2%)</td>
</tr>
<tr>
<td>More than the suggested…</td>
<td>6 (37.5%)</td>
<td>6 (35.3%)</td>
<td>7 (38.9%)</td>
</tr>
<tr>
<td>Do not exercise</td>
<td>2 (12.5%)</td>
<td>1 (5.9%)</td>
<td>2 (11.1%)</td>
</tr>
<tr>
<td><strong>Alcohol Consumption(^a)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drink the suggested amount</td>
<td>5 (31.3%)</td>
<td>5 (29.4%)</td>
<td>1 (5.6%)</td>
</tr>
<tr>
<td>Drink more than…</td>
<td>2 (12.5%)</td>
<td>3 (17.5%)</td>
<td>3 (16.7%)</td>
</tr>
<tr>
<td>Drink less than…</td>
<td>8 (50.0%)</td>
<td>8 (47.1%)</td>
<td>13 (72.2%)</td>
</tr>
<tr>
<td>Do not drink alcohol</td>
<td>1 (6.3%)</td>
<td>1 (5.9%)</td>
<td>1 (5.6%)</td>
</tr>
<tr>
<td><strong>Smoking Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>2 (12.5%)</td>
<td>3 (17.6%)</td>
<td>3 (16.7%)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>-</td>
<td>3 (17.6%)</td>
<td>-</td>
</tr>
<tr>
<td>Never smoked</td>
<td>14 (87.5%)</td>
<td>11 (64.7%)</td>
<td>15 (83.3%)</td>
</tr>
</tbody>
</table>

\(^a\)For full item descriptions and the suggested amounts of exercise and alcohol consumption see Appendix H.
From participants reported medical history, it was noted that 100% of the sample had no personal history of CVD, and high levels of no on-going medical issues (77.8% - 94.1% across the three groups). Additionally, high rates of no family history of CVD were reported (75% - 94.4%). When reviewing their health behaviours, several patterns were noted for the sample. Over half of participants in each group reported that they usually watched what they ate but they liked to treat themselves sometimes (50% - 68.8%). The clear majority of participants reported that they had no history of a diagnosis for depression and/or anxiety (68.8% - 88.2% across the three groups).

The reported rates of no exercise were low for all three groups (11.1% - 12.5%); however, no obvious patterns emerged for the different rates of exercise in which participants completed in the average week. The majority of participants reported that they drank less than the suggested amount (see Appendix H; 47.1% - 72.2% across the three groups). The numbers of participants that did not drink were low – one participant per group. Predominantly, it was found that the sample had never smoked (64.7% - 87.5% across the three groups).

3.4.2 Descriptive statistics

3.4.2.1 Word search puzzle

Table 3.6 shows the descriptive statistics for the results of the word search puzzles, measured using three variables, with the data split across the three information-processing groups.

3.4.2.2 Affective and cognitive information processing

Descriptive statistics for affective and cognitive information are presented in Table 3.7, with the data split across the three information processing groups. For affective information processing, the NFA, PANAS-X and their associated subscales
are presented. The two general subscales from the PANAS-X have been included (general negative and positive affect).

Table 3.6

Descriptive statistics for items measuring results of the word search puzzles

<table>
<thead>
<tr>
<th>Word Search Puzzle Measure</th>
<th>Positive Affective ( (n = 16) )</th>
<th>Negative Affective ( (n = 17) )</th>
<th>Cognitive ( (n = 18) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M (SD; 95% CI) )</td>
<td>( M (SD; 95% CI) )</td>
<td>( M (SD; 95% CI) )</td>
</tr>
<tr>
<td>Number of words found</td>
<td>6.00 (2.20; 4.78, 7.22)</td>
<td>8.82 (2.90; 7.33, 10.31)</td>
<td>6.83 (2.60; 5.54, 8.12)</td>
</tr>
<tr>
<td>Number of neutral words</td>
<td>2.33 (1.05; 1.75, 2.91)</td>
<td>5.71 (1.36; 5.01, 6.40)</td>
<td>3.50 (1.79; 2.61, 4.39)</td>
</tr>
<tr>
<td>Number of non-neutral</td>
<td>3.67 (1.54; 2.81, 4.52)</td>
<td>3.12 (1.90; 2.14, 4.09)</td>
<td>3.33 (1.72; 2.48, 4.19)</td>
</tr>
<tr>
<td>words found</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( ^a \)Non-neutral word describes words that were valenced according to the information processing groups (e.g., affective positive words, affective negative words, and cognitive words).

For information pertaining to further PANAS-X subscales see Appendix K. For cognitive information processing, descriptive statistics for the NFC and the REI-40 subscales are included.

3.4.2.3 Risk perception, efficacy and understanding

Descriptive statistics for the thirteen items included to measure risk perception, efficacy and participant’s understanding of the risk information are presented in Table 3.8, with the data split across the three information-processing groups.

3.4.3 Differences between information processing groups

One-way between-groups ANOVAs were completed to examine differences between the information processing groups in terms of their affective and cognitive information processing, and risk perception measures. Analyses of interest and with significant results are described below, see Appendix K for additional analyses.
Table 3.7

**Descriptive statistics for affective and cognitive information processing**

<table>
<thead>
<tr>
<th>Affective Information Processing Measures</th>
<th>Positive Affective $(n = 16)$</th>
<th>Negative Affective $(n = 17)$</th>
<th>Cognitive $(n = 18)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for Affect</td>
<td>$M (SD; 95% CI)$</td>
<td>$M (SD; 95% CI)$</td>
<td>$M (SD; 95% CI)$</td>
</tr>
<tr>
<td>Need to approach emotions</td>
<td>18.07 (21.66; 6.07, 30.06)</td>
<td>27.29 (19.20; 17.42, 37.17)</td>
<td>21.33 (14.91; 13.92, 28.75)</td>
</tr>
<tr>
<td>Need to avoid emotions</td>
<td>-5.87 (12.83; -12.97, 1.24)</td>
<td>-11.41 (12.22; -17.70, -5.13)</td>
<td>-8.11 (11.88; -14.02, -2.20)</td>
</tr>
<tr>
<td>PANAS-X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General negative affect</td>
<td>13.00 (4.84; 10.32, 15.68)</td>
<td>14.59 (3.97; 12.55, 16.63)</td>
<td>13.11 (4.13; 11.06, 15.16)</td>
</tr>
<tr>
<td>General positive affect</td>
<td>27.20 (5.93; 23.92, 30.48)</td>
<td>28.41 (9.16; 23.70, 33.12)</td>
<td>25.28 (8.22; 21.19, 29.36)</td>
</tr>
<tr>
<td>Need for Cognition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REI-40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rational ability</td>
<td>3.48 (0.64; 3.13, 3.83)</td>
<td>3.51 (0.62; 3.19, 3.83)</td>
<td>3.400 (0.66; 3.07, 3.73)</td>
</tr>
<tr>
<td>Rational engagement</td>
<td>3.75 (0.44; 3.51, 4.00)</td>
<td>3.90 (0.80; 3.49, 4.31)</td>
<td>3.62 (0.81; 3.22, 4.02)</td>
</tr>
<tr>
<td>Experiential ability</td>
<td>3.03 (0.69; 2.65, 3.41)</td>
<td>3.24 (0.90; 2.78, 3.70)</td>
<td>3.36 (0.61; 3.06, 3.66)</td>
</tr>
<tr>
<td>Experiential engagement</td>
<td>3.29 (0.64; 2.94, 3.65)</td>
<td>3.43 (0.66; 3.09, 3.78)</td>
<td>3.48 (0.84; 3.06, 3.90)</td>
</tr>
</tbody>
</table>
Table 3.8

**Descriptive statistics for risk perception measures**

<table>
<thead>
<tr>
<th>Risk Perception Measures</th>
<th>Positive Affective ((n = 16))</th>
<th>Negative Affective ((n = 17))</th>
<th>Cognitive Affective ((n = 18))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal susceptibility</td>
<td>(M = 3.73) (SD = 1.58; 95% CI = 2.86, 4.61)</td>
<td>(M = 3.61) (SD = 1.69; 95% CI = 2.79, 4.38)</td>
<td>(M = 4.17) (SD = 1.39; 95% CI = 3.96, 5.45)</td>
</tr>
<tr>
<td>Comparative susceptibility</td>
<td>(M = 4.93) (SD = 1.39; 95% CI = 4.71)</td>
<td>(M = 4.50) (SD = 1.34; 95% CI = 4.71)</td>
<td>(M = 4.07) (SD = 1.50; 95% CI = 3.96, 5.16)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>(M = 6.47) (SD = 1.68; 95% CI = 6.11, 6.82)</td>
<td>(M = 6.04) (SD = 1.39; 95% CI = 4.77, 6.65)</td>
<td>(M = 6.11) (SD = 1.79; 95% CI = 3.96, 5.16)</td>
</tr>
<tr>
<td>Perceived worry</td>
<td>(M = 4.73) (SD = 1.90; 95% CI = 4.12)</td>
<td>(M = 3.44) (SD = 1.24; 95% CI = 3.08, 5.16)</td>
<td>(M = 3.74) (SD = 1.79; 95% CI = 3.08, 5.16)</td>
</tr>
<tr>
<td>Perceived anxiety</td>
<td>(M = 2.40) (SD = 1.50; 95% CI = 1.57, 3.23)</td>
<td>(M = 2.53) (SD = 1.42; 95% CI = 1.80, 3.26)</td>
<td>(M = 1.57) (SD = 1.39; 95% CI = 1.80, 3.26)</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>(M = 6.40) (SD = 1.30; 95% CI = 5.68, 7.12)</td>
<td>(M = 6.06) (SD = 1.03; 95% CI = 5.53, 6.59)</td>
<td>(M = 6.00) (SD = 1.03; 95% CI = 5.53, 6.59)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>(M = 6.47) (SD = 0.83; 95% CI = 6.00, 6.93)</td>
<td>(M = 6.41) (SD = 0.87; 95% CI = 5.96, 6.86)</td>
<td>(M = 6.47) (SD = 0.83; 95% CI = 6.00, 6.93)</td>
</tr>
<tr>
<td>Willingness to take regular action</td>
<td>(M = 6.07) (SD = 0.80; 95% CI = 5.62, 6.51)</td>
<td>(M = 6.35) (SD = 1.00; 95% CI = 5.84, 6.87)</td>
<td>(M = 5.60) (SD = 1.72; 95% CI = 4.62, 6.55)</td>
</tr>
<tr>
<td>Willingness to take a test</td>
<td>(M = 5.60) (SD = 1.72; 95% CI = 4.62, 6.55)</td>
<td>(M = 6.24) (SD = 1.20; 95% CI = 5.62, 6.85)</td>
<td>(M = 5.60) (SD = 1.72; 95% CI = 4.62, 6.55)</td>
</tr>
<tr>
<td>Attention to future symptoms</td>
<td>(M = 5.40) (SD = 1.06; 95% CI = 5.40, 5.98)</td>
<td>(M = 5.35) (SD = 1.32; 95% CI = 4.67, 6.03)</td>
<td>(M = 5.40) (SD = 1.06; 95% CI = 5.40, 5.98)</td>
</tr>
<tr>
<td>Clarity of information</td>
<td>(M = 6.07) (SD = 0.70; 95% CI = 5.68, 6.46)</td>
<td>(M = 5.71) (SD = 1.26; 95% CI = 5.06, 6.36)</td>
<td>(M = 5.68) (SD = 0.70; 95% CI = 5.06, 6.36)</td>
</tr>
<tr>
<td>Understanding of risk information</td>
<td>(M = 6.20) (SD = 0.78; 95% CI = 5.77, 6.63)</td>
<td>(M = 6.24) (SD = 0.83; 95% CI = 5.81, 6.66)</td>
<td>(M = 5.77) (SD = 0.88; 95% CI = 5.39, 6.50)</td>
</tr>
<tr>
<td>Satisfaction with amount of risk information</td>
<td>(M = 5.73) (SD = 0.88; 95% CI = 5.73, 6.22)</td>
<td>(M = 6.18) (SD = 0.95; 95% CI = 5.73, 6.69)</td>
<td>(M = 5.24) (SD = 0.88; 95% CI = 5.69, 6.67)</td>
</tr>
</tbody>
</table>

### 3.4.3.1 Affective information processing

In order to test hypothesis one, one-way between groups ANOVAs were conducted on the complete NFA and the two main subscales from the PANAS-X (general negative and positive affect) to examine if there were any differences between the three information-processing groups in terms of their affective information processing. No significant differences were noted between the groups (see Appendix K). Furthermore, no significant differences were noted between the information-
processing groups for any of the sub-scales of the PANAS-X for more specific affects (see Appendix K).

3.4.3.2 Cognitive information processing

One-way between groups ANOVAs were conducted on the NFC and the four subscales of the REI-40 (rational ability, rational engagement, experiential ability and experiential engagement) to examine if there were any differences between the three information-processing groups in terms of their cognitive information processing. No significant differences were noted between the groups (see Appendix K), and therefore no evidence emerged to support hypothesis two.

3.4.3.3 Risk perception, efficacy and understanding

To assess hypotheses three and four, one-way between groups ANOVAs were conducted on the 13 items measuring risk perception, efficacy and understanding of the risk information. No significant differences were noted between the three information processing groups for the 13 items. However, it was noted that willingness to take regular action, likelihood of paying attention to cardiac symptoms in the future and confidence in understanding the risk information were approaching significance (see Table 3.9). Inspection of the means showed that the largest differences were occurring between the negative affective and cognitive groups for all three measures.

Table 3.9

*Parametric and non-parametric analyses of outcomes approaching significance*

<table>
<thead>
<tr>
<th>Risk Perception Measures</th>
<th>ANOVA</th>
<th>Levene’s</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention to future symptoms</td>
<td>F(2, 48) = 1.38, p = .262</td>
<td>2, 48</td>
<td>2.54</td>
<td>.089</td>
<td></td>
</tr>
<tr>
<td>Understanding of risk information</td>
<td>F(2, 48) = 0.87, p = .424</td>
<td>2, 48</td>
<td>2.84</td>
<td>.069</td>
<td></td>
</tr>
</tbody>
</table>

**Kruskal-Wallis Test**

<table>
<thead>
<tr>
<th>Risk Perception Measures</th>
<th>Levene’s</th>
<th>df</th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to take regular action</td>
<td>F(2, 48) = 3.97, p &lt; .05</td>
<td>2</td>
<td>5.92</td>
<td>.052</td>
</tr>
</tbody>
</table>
3.4.3.4 Word search puzzles

Given the above results and no evidence to support the four hypotheses as outline in section 3.2.3.1, analyses were conducted on the main outcome measures of the word search puzzles to access their effectiveness. Three one-way between groups ANOVAs were conducted on the total number of words found, the number of neutral words found and the number of non-neutral words found between the three information-processing groups.

For the analysis examining the total number of words found in the word search puzzle, Levene’s test for homogeneity of variance was not significant; $F(2, 48) = .53$ $p = .591$. It was found that there was a significant difference between the information processing groups in the total number of words found; $F(2, 48) = 5.75$, $p < .01$, partial $\eta^2 = .19$ (see Figure 3.3).

![Bar chart of means for total number of words found across the information-processing groups.](image)

**Figure 3.3.** Bar chart of means for total number of words found across the information-processing groups. *Note.* Error bars based on standard error.

To elucidate this significant difference, Tukey HSD tests with correction for multiple comparisons were conducted and an adjusted alpha value of 0.02 was utilised in accordance with Bonferroni corrections (Field, 2013). The analysis revealed a
significant difference between the affective positive ($M = 5.81$, $SD = 2.26$; 95% CI = 4.61, 7.02) and affective negative ($M = 8.82$, $SD = 2.90$; 95% CI = 7.33, 10.31) groups; $p < .01$.

For the ANOVA examining the number of neutral words found by participants in the word search puzzle (15 neutral words in total), Levene’s test for homogeneity of variance was not significant; $F(2, 48) = .74$, $p = .481$. It was found that there was a significant difference between the information processing groups in the number of neutral words found; $F(2, 48) = 24.16$, $p < .001$, partial $\eta^2 = .50$. Tukey HSD tests with Bonferroni correction for multiple comparisons ($p = 0.02$) revealed a significant difference between the affective positive ($M = 2.25$, $SD = 1.07$; 95% CI = 1.68, 2.82) and affective negative groups ($M = 5.71$, $SD = 1.36$; 95% CI = 5.01, 6.40; $p < .001$). Furthermore, the affective negative group was significantly different from the cognitive group ($M = 3.50$, $SD = 1.79$; 95% CI = 2.61, 4.39; $p < .001$; see Figure 3.4).

![Bar chart of means for number of neutral words found across the information processing groups.](image)

*Figure 3.4.* Bar chart of means for number of neutral words found across the information processing groups. *Note.* Error bars based on standard error.

A one-way between-groups ANOVA was also completed to evaluate the total number of non-neutral words found in the word search puzzle across the three
information processing groups. Levene’s test for homogeneity of variance was not significant, $F(2, 48) = .19, p = .825$, and no significant difference was found between the information processing groups in the number of non-neutral words found; $F(2, 48) = 0.27, p = .763$.

### 3.4.4 Summary of results

The study found no evidence to support the use of affective- and cognitive-based manipulations for information processing and risk perception in terms of CVD, and therefore none of the four hypotheses were supported. No differences were found between the three information processing groups for affective and cognitive processing (hypotheses one and two), as measured by a number of standardised questionnaires (e.g., NFA, NFC, REI, PANAS-X). Furthermore, the three information processing groups had no significant effects on a number of measures of CVD risk perception (hypotheses three and four). However, it should be noted that the measures for risk perception included in the current study did not form part of a standardised questionnaire. Common measures of risk perception were included based on examinations of previous research assessing similar constructs (Brewer et al., 2007; Conner & Norman, 1995; Strecher et al., 1986; Waters, 2008).

Given the lack of differences seen in both forms of information processing and risk perception, further analyses were conducted on the direct outcomes of the word search puzzles (e.g., number of words found). The findings of such would suggest that further examination of the word search puzzles is warranted as differences were noted between the information processing groups in the immediate outcome measures of the manipulation. Significant differences in the total number of words found were observed, where the positive affective group found significantly lower total words than the negative affective group. Furthermore, differences between all three information
processing groups were found among the number of neutral words found within the word search puzzles. The positive affective group found the lowest number of neutral words, followed by the cognitive group and the negative affective group found the highest number of neutral words within the word search puzzle.

3.5 Factor Analysis on Risk Perception Questionnaire

As mentioned above the measures of risk perception included in the current study were not part of a standardised measure of health risk perception. Instead the measures were informed from previous research examining similar constructs (Brewer et al., 2007; Conner & Norman, 1995; Strecher et al., 1986; Waters, 2008). However, previous research has shown that measures of risk perception can be influenced by bias, prior behaviour and the particular domain of threat in question (Sjöberg, Moen, & Rundmö, 2004; Weber, Blais, & Betz, 2002; Weinstein & Nicolich, 1993), particularly when considering a topic that may be of a sensitive nature (e.g., health risks). Given such, some authors have called for more theory-based measurements of health risk perceptions (French & Marteau, 2008). To ensure the validity and effectiveness of the measures included in the risk perception questionnaire in the current study, an exploratory factor analysis (EFA) was conducted. If such measures are to be used for predictive and manipulation purposes in terms of risk perception then greater understanding of the underlying processes is required (Weber et al., 2002).

An EFA was conducted on the 13 items included in the risk perception questionnaire (RPQ). The 13 items aimed to measure a number of aspects relating the risk perception, efficacy and understanding of the CVD risk message (see Appendix I). The EFA was completed on the data from study one and a subset of data from an additional study that was started after study one (see Appendix L). The EFA was conducted on the RPQ data from 76 participants: 51 from study one and 25 from an
additional study that was started initially after study one. Given the lack of evidence to support the image and word search puzzle manipulation in study one, a second version of the study, which included an affirmation task, was started. The affirmation task was included to alleviate any potential defensive reactions by participants when presented with the health risk information that may have affected their risk perceptions (Ferrer, Shmueli, Bergman, Harris, & Klein, 2012; Howell & Shepperd, 2012; Sherman, Nelson, & Steele, 2000; van Koningsbruggen et al., 2014). However, given the results of the current exploratory factor analysis, the initial second study was concluded early and future research was conducted in line with the current results. The suitability of the data for EFA was assessed independently for each model and discussed below.

Principal component analysis (PCA) with orthogonal (varimax) rotation was chosen as no assumption was made on whether the items were related (Gorsuch, 1983), due to a lack of research examining standardised health risk perception questionnaires. Factor loadings greater than 0.3 were retained and considered to be salient (Kline, 2002). Once the relevant factors for each model were established, Cronbach’s alpha (α) values (Cronbach, 1990) were computed to assess the internal consistency of each factor. The general rule-of-thumb as originally outline by Nunally (1978) was used to evaluate the α values: greater than .9 = excellent; greater than .8 = good; greater than .7 = acceptable; greater than .6 = questionable; greater than .5 = poor; and less than .5 = unacceptable.

3.5.1 Initial factor analysis

After accessing the RPQ measures individually, EFA was conducted to examine the underlying, higher-level concepts and possible factor structure of the 13 RPQ questionnaire. Inspection of the correlation matrix revealed the presence of a number of correlations above and below .3 (see Table 3.10).
Table 3.10

Correlation matrix for all RPQ variables

<table>
<thead>
<tr>
<th>RPQ item</th>
<th>RPQ 1</th>
<th>RPQ 2</th>
<th>RPQ 3</th>
<th>RPQ 4</th>
<th>RPQ 5</th>
<th>RPQ 6</th>
<th>RPQ 7</th>
<th>RPQ 8</th>
<th>RPQ 9</th>
<th>RPQ 10</th>
<th>RPQ 11</th>
<th>RPQ 12</th>
<th>RPQ 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPQ 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 2</td>
<td>.060</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 3</td>
<td>-2.51*</td>
<td>.174</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RPQ 4</td>
<td>.067</td>
<td></td>
<td>.184</td>
<td></td>
<td></td>
<td></td>
<td>.352**</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 5</td>
<td>.297**</td>
<td>.016</td>
<td>.024</td>
<td>.616**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 6</td>
<td>-2.67*</td>
<td>.021</td>
<td>.237*</td>
<td>.033</td>
<td>-1.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 7</td>
<td>-2.75*</td>
<td>.193</td>
<td>.290*</td>
<td>.012</td>
<td>-0.54</td>
<td>.324**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 8</td>
<td>-2.87*</td>
<td>.174</td>
<td>.127</td>
<td>.312**</td>
<td>.152</td>
<td>.159</td>
<td>.470**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 9</td>
<td>-0.87</td>
<td>.118</td>
<td>.130</td>
<td>.121</td>
<td>.074</td>
<td>.314**</td>
<td>.212</td>
<td>.313**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 10</td>
<td>0.15</td>
<td>.239*</td>
<td>.234*</td>
<td>.417**</td>
<td>.166</td>
<td>.233*</td>
<td>.263*</td>
<td>.441**</td>
<td>.230*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 11</td>
<td>0.37</td>
<td>.272*</td>
<td>.184</td>
<td>-.001</td>
<td>-.145</td>
<td>.107</td>
<td>.063</td>
<td>.041</td>
<td>.167</td>
<td>.034</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 12</td>
<td>-0.50</td>
<td>.068</td>
<td>.136</td>
<td>.200</td>
<td>.029</td>
<td>.100</td>
<td>.026</td>
<td>.187</td>
<td>.236*</td>
<td>.132</td>
<td>.509**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPQ 13</td>
<td>0.51</td>
<td>.174</td>
<td>-.021</td>
<td>.109</td>
<td>.075</td>
<td>-.107</td>
<td>-.058</td>
<td>.134</td>
<td>.186</td>
<td>.076</td>
<td>.548**</td>
<td>.483**</td>
<td></td>
</tr>
</tbody>
</table>

Note. * p < .05, ** p < .01. RPQ 1 = Personal susceptibility; RPQ 2 = Comparative susceptibility; RPQ 3 = Perceived severity; RPQ 4 = Perceived worry; RPQ 5 = Perceived anxiety; RPQ 6 = Response efficacy; RPQ 7 = Self efficacy; RPQ 8 = Willingness to take regular action; RPQ 9 = Willingness to take a test; RPQ 10 = Attention to future symptoms; RPQ 11 = Clarity of risk information; RPQ 12 = Understanding of risk information; RPQ 13 = Satisfaction with amount of information
The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found to be .617, above the necessary 0.5, and Bartlett’s test of sphericity was found to be significant, $\chi^2 (78) = 251.09, p < .001$, showing there were meaningful correlations underlying the data. The results of the KMO and Bartlett’s tests indicated that the data were appropriate for exploratory factor analysis.

### 3.5.1.1 Factor extraction

PCA (un-rotated) revealed the presence of five factors with eigenvalues exceeding one, explaining 22.99%, 15.11%, 14.28%, 8.12% and 7.84% of the variance respectively. Some previous research has argued for retaining all factors with eigenvalues over one due to the sizeable amount of variance explained in such (Kaiser, 1974). However, others would suggest that judgements based on the scree plot are a reliable criterion for factor selection particularly when the aim is a more parsimonious model (Cattell & Vogelmann, 1977).

Since factor four and five explained relatively low percentages of the variance and as both only had one item (item two for factor four and item three for factor five), it was decided to remove factor four and five. This was supported further by inspection of the scree plot as a clear separation can be seen between the $3^{rd}$ and $4^{th}$ component (see Figure 3.5).

Following removal of factors four and five, factors one, two and three were found to explain 22.99%, 15.12% and 14.28% of the variance respectively. To aid in the interpretation of the three-factor model, orthogonal (varimax) rotation was performed. Following the rotation, factors one, two, and three accounted for 19.00%, 17.08% and 16.29% of the variance (52.37% in total), with eigenvalues of 2.47, 2.22 and 2.12 respectively. See Table 3.11 below for item loadings.
Figure 3.5. Scree plot for principle components analysis (un-rotated) on the 13 risk perception measures. Note. See Appendix I for description of individual RPQ items.

Table 3.11

Varimax rotated item loadings for three factor solution

<table>
<thead>
<tr>
<th>Risk Perception</th>
<th>Factors 1</th>
<th>Factors 2</th>
<th>Factors 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal susceptibility</td>
<td>-.612</td>
<td>.074</td>
<td>.320</td>
</tr>
<tr>
<td>Comparative susceptibility</td>
<td>.196</td>
<td>.327</td>
<td>.227</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>.505</td>
<td>.112</td>
<td>.205</td>
</tr>
<tr>
<td>Perceived worry</td>
<td>.115</td>
<td>.100</td>
<td>.856</td>
</tr>
<tr>
<td>Perceived anxiety</td>
<td>-.213</td>
<td>-.053</td>
<td>.825</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>.651</td>
<td>.020</td>
<td>-.113</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.735</td>
<td>-.023</td>
<td>.032</td>
</tr>
<tr>
<td>Willingness to take regular action</td>
<td>.602</td>
<td>.121</td>
<td>.378</td>
</tr>
<tr>
<td>Willingness to take a test</td>
<td>.431</td>
<td>.311</td>
<td>.150</td>
</tr>
<tr>
<td>Attention to future symptoms</td>
<td>.448</td>
<td>.096</td>
<td>.545</td>
</tr>
<tr>
<td>Clarity of risk information</td>
<td>.066</td>
<td>.847</td>
<td>-.143</td>
</tr>
<tr>
<td>Understanding of risk information</td>
<td>.101</td>
<td>.759</td>
<td>.078</td>
</tr>
<tr>
<td>Satisfaction with amount of information</td>
<td>-.122</td>
<td>.818</td>
<td>.078</td>
</tr>
</tbody>
</table>
3.5.1.2 Reliability

Cronbach’s alpha values were calculated for the three factor solution to analyse internal consistency. Factor one was found to have an alpha value of .268, raising questions about its internal reliability. Factors two and three were found to have alpha values of .664 and .674, both nearing an acceptable level for internal reliability.

3.5.1.3 Factors

From the analysis, factor one could be suggested to measure participants’ risk beliefs (perceived susceptibility and perceived severity) and how they manage such beliefs (response efficacy, self-efficacy, willingness to take regular action and willingness to take a test). However, there are problems with such an interpretation. Previous research has shown a strong link between perceived severity and perceived susceptibility for health threats (Witte, 1992, 1998; Witte & Allen, 2000); however, the negative relationship between such found in this study is in contrast to the majority of previous results. Within this analysis, it was found that participants perceived getting CVD as very serious, but they did not perceive their susceptibility of getting CVD at some stage in the future as high.

Through the use of factor analysis, other studies have shown that perceived susceptibility and perceived severity are related, but separate constructs in the perception of risk (Cadarette, Beaton, & Hawker, 2004; Harris, Linn, Skyler, & Sandifer, 1987; Weissfeld, Brock, Kirsch, & Hawthorne, 1987; Zagummy & Brady, 1998). Furthermore, the results of such have shown that predominantly positive correlations have been found between the two, ranging from between .06 and .35 (Sheeran, Harris, & Epton, 2014). Perceived susceptibility and perceived severity are excepted to act together on behaviours and intentions (Brewer et al., 2007; Weinstein,
2000); however, Sheeran et al. (2014) did highlight that many studies have failed to find this combined effect.

Putting aside the negative correlation between perceived susceptibility and perceived severity, it is tentatively suggested that factor one and factor three are similar to the danger- and fear-control processes of the Extended Parallel Process Model (EPPM; Witte, 1992; Witte & Allen, 2000); a model that posits a dual processing approach for how we process and respond to threatening health messages (Gore & Bracken, 2005). The remaining items in factor one (response efficacy, self-efficacy, willingness to take regular action and willingness to take a test) deal predominantly with how individuals view their ability to take action against the health threat and whether they are willing to take such action. While the items in factor three are mainly based on participants’ emotional responses to the risk threat (perceived worry, perceived anxiety, and attention to future symptoms). Of note, although likelihood to pay attention to future cardiac symptoms is close to a cross loading with factor one, it is not significant and generally the item loads onto factor three.

Within the EPPM, danger-control processes are defined as “cognitive processes, inducing protection motivation that occurs when [an individual] believes she or he is able to effectively avert a significant and relevant threat through self-protective changes” (Popova, 2012). While danger control processes are believed to be more cognitive-based ones in reaction to a health threat, fear control processes are posited as emotional-based ones, dealing with the negative emotional reactions to a perceived health threat (McQueen, Vernon, & Swank, 2012; Popova, 2012). When trying to control the danger posed by the threat, the individual will attempt to adhere to the recommendations of the health message (e.g., engaging in the preventive behaviour that minimises the danger), or the individual will attempt to control the fear, not by taking
part in the preventive behaviour but through defensive avoidance or denial (Dutta-Bergman, 2005; McQueen et al., 2012). Studies have found support for the main predictions of the EPPM when dealing with health threats such as meningitis among college students (Gore & Bracken, 2005); HIV/AIDS (Cho & Witte, 2004) and testicular cancer (Evans, Beeken, Steptoe, & Wardle, 2012).

Due to the points outlined above, a refined three factor model was suggested for investigation where perceived susceptibility and perceived severity were removed from the analysis to examine if more robust factors can be found in terms of danger- and fear-control processes from the EPPM (Witte, 1992; Witte & Allen, 2000). Additionally, comparative susceptibility was removed due to its lack of conceptually consistency with the other items in factor two and its low item loading.

### 3.5.2 Refined three factor model

A refined three factor model was investigated by removing the first three RPQ measures (personal susceptibility, comparative susceptibility and perceived severity) from the analysis. PCA was conducted on 10 of the RPQ measures with orthogonal (varimax) rotation. The KMO measure of sampling adequacy was found to be .640, and Bartlett’s test of sphericity was found to be significant, $\chi^2 (45) = 184.21, p < .001$, indicating that the data were appropriate for exploratory factor analysis. The overall model explained 61.76% of the variance, where factors one, two, and three accounted for 21.45%, 21.02% and 19.29% of the variance and with eigenvalues of 2.15, 2.10 and 1.93 respectively. See Table 3.12 below for item loadings.

#### 3.5.2.1 Reliability

Cronbach’s alpha values were calculated for the refined three factor solution to analyse internal consistency. Factor one was found to have an alpha value of .650.
Factor two was found to have an alpha value of .757. Furthermore, factor three was found to have an alpha value of .739.

Table 3.12

**Varimax rotated item loadings for refined three factor solution**

<table>
<thead>
<tr>
<th>Risk Perception</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>‘Danger-control’</td>
</tr>
<tr>
<td>Perceived worry</td>
<td>.125</td>
</tr>
<tr>
<td>Perceived anxiety</td>
<td>-.115</td>
</tr>
<tr>
<td>Response efficacy</td>
<td><strong>.678</strong></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td><strong>.756</strong></td>
</tr>
<tr>
<td>Willingness to take regular action</td>
<td><strong>.663</strong></td>
</tr>
<tr>
<td>Willingness to take a test</td>
<td>.546</td>
</tr>
<tr>
<td>Attention to future symptoms</td>
<td>.562</td>
</tr>
<tr>
<td>Clarity of risk information</td>
<td>.087</td>
</tr>
<tr>
<td>Understanding of risk information</td>
<td>.134</td>
</tr>
<tr>
<td>Satisfaction with amount of information</td>
<td>-.068</td>
</tr>
</tbody>
</table>

The alpha values across all three factors increased compared to the initial factor analysis. Factor two and three both reached acceptable levels for internal consistency. Although the alpha value for factor one had not quite reached the acceptable level according to Nunally’s (1978) guidelines, it had increased considerably compared to the unacceptable alpha value that had been computed within the initial factor model.

**3.5.2.2 Factors**

After refining the items included in the factor analysis, the factors produced were found to conceptually be more similar with one another, have better internal reliability and no cross-loadings. Within factor two, all three items dealing with participants’ beliefs about the risk information were found to have large item loadings and had high internal consistency. Factors one and three were still deemed to be similar to the danger- and fear-control aspects of the EPPM (Witte, 1992; Witte & Allen, 2000). The refined three factor solution is suggested as a suitable model, with factor one.
labelled as ‘Danger-control’, factor two as ‘Information’ and factor three as ‘Emotion-control’ for subsequent discussion.

3.5.3 Re-analysis of study one utilising refined three factor model

Given the above results of the factor analysis, one-way between-groups ANOVAs were conducted to assess if any differences existed between the three information processes groups on the factors found in the refined three factor model. Participants were randomly assigned to one of three information processing groups: affective positive ($n = 16$), affective negative ($n = 17$) and cognitive ($n = 18$). Descriptive statistics for the three factors are presented in Table 3.13, with the data split across the three information processing groups.

Table 3.13

<table>
<thead>
<tr>
<th>Factors</th>
<th>Positive Affective ($n = 16$)</th>
<th>Negative Affective ($n = 17$)</th>
<th>Cognitive ($n = 18$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
</tr>
<tr>
<td>‘Danger-control’</td>
<td>29.88 (3.90; 27.80, 31.95)</td>
<td>30.41 (3.30; 28.72, 32.11)</td>
<td>27.83 (4.94; 25.38, 30.29)</td>
</tr>
<tr>
<td>‘Emotion-control’</td>
<td>6.81 (3.15; 5.14, 8.49)</td>
<td>6.65 (3.06; 5.07, 8.22)</td>
<td>5.17 (2.73; 3.81, 6.52)</td>
</tr>
<tr>
<td>‘Information’</td>
<td>17.86 (1.99; 16.81, 18.94)</td>
<td>18.12 (2.34; 16.91, 19.32)</td>
<td>17.33 (2.74; 15.97, 6.52)</td>
</tr>
</tbody>
</table>

3.5.3.1 ‘Danger-control’ factor

For assessing the differences between the three information processing groups for the ‘danger-control’ factor, Levene’s test for homogeneity of variance was not significant; $F(2, 48) = 1.41$, $p = .253$. No significant differences were found between the information processing groups for the ‘danger-control’ factor; $F(2, 48) = 1.91$, $p = .159$. 
3.5.3.2 ‘Emotion-control’ factor

When examining the ‘emotion-control’ factor, Levene’s test for homogeneity of variance was not significant; \( F(2, 48) = .24, p = .787 \). The analysis found no significant differences in ‘emotion-control’ between the information processing groups; \( F(2, 48) = 1.62, p = .209 \).

3.5.3.3 ‘Information’ factor

Lastly, for the ‘Information’ factor from the refined three factor model, Levene’s test for homogeneity of variance was not significant; \( F(2, 48) = 1.20, p = .309 \). No significant differences were found between the three information processing groups on the ‘information’ factor; \( F(2, 48) = 0.49, p = .614 \).

3.6 Discussion

3.6.1 Study one

This study provided a novel examination of cognitive and affective-based information processing for CVD risk perception. The study attempted to prime participants into a cognitive, positive-affective or negative-affective salient information-processing mode through a manipulation utilising images and a word search puzzle. As discussed in section 3.4.4, the current investigation did not find any evidence to support the use of such for impacting both information processing modes and risk perception in terms of CVD. The implications of such are discussed in the following sections.

3.6.1.1 Theoretical implications

Recent calls within the literature have suggested greater consideration for dual aspects of risk probability in health risks and behaviour theories (Janssen et al., 2011, 2013; Janssen et al., 2012; Janssen et al., 2014). The current study attempted to provide a novel examination of dual information processing in relation to CVD risk perception.
due to the lack of previous research on such. The significant differences found between
the information-processing groups in terms of the immediate measures from the word
search puzzles (e.g., total number of words found and number of neutral words found)
suggest that future research may be warranted into the use of word search puzzles for
manipulating information-processing modes. However, the effects are on the immediate
outcomes of the task and within the current study did not carry over to impact measures
of affective or cognitive-based information-processing or measures of CVD risk
perception, efficacy or understanding of the information.

Concerns could be raised considering that the significant differences were noted
in the total number of words found and seemed to be stemming from the differences in
the neutral words that were found. Results from previous research (van den Berg et al.,
2006; van Gelder et al., 2009) would have suggested that the affective-based groups
would be more likely to find more affective-based words in this instance. Similarly it
would be expected that the cognitive-based information-processing group would be find
more cognitive-based words. However, in this study no differences were found between
the number of non-neutral (positive, negative or cognitive) words found by participants.

In relation to the lack of differences found from the affective information
processing groups, there is some argument within the literature regarding incidental
versus integral affect. Incidental affect is considered as affect which is generated prior
to and independent of the context, but which can have an indirect or direct impact on
judgements (Wardman, 2006). Within study one, the presentation of the affective
images and word search puzzles prior to the health risk information were found not to
have an impact on participants’ affective information processing. A possible reason for
such could be that integral affect (affect generated in, as part of the context and which is
directly related to the judgement; Wardman, 2006) would be more effective in
impacting the risk perception. Incidental affect, that which is not a direct component of the context or task being assessed (Wardman, 2006), was utilised in the current study, and therefore may have been less effective. Integral affects, which are moods and/or emotions, associated with a particular stimulus (Lerner & Keltner, 2000), such as positively- or negatively-phrased risk information about CVD, could potentially have a greater impact on risk perceptions. When positing the affect-as-information hypothesis (Clore, Schwarz, & Conway, 1994; Schwarz & Clore, 1983), Clore (1992) argued that feelings, which are not related to the decision or judgement in front of the individual, would have their influence reduced or eliminated due to the lack of direct or immediate relevance. The same reasoning could possibly explain the lack of impact from the cognitive manipulations.

3.6.1.2 Practical implications

Within study one, manipulations combining image-based presentations and word search puzzles were utilised to attempt to induce positive affective, negative affective and cognitive based information processing modes in participants, and examine the relation of such to a health risk. However, the lack of significant findings raises questions about the suitability of such methods for impacting dual information processing and CVD risk perceptions. Study one sought to replicate and extend the findings of van den Berg et al. (2006) and van Gelder et al. (2009). For the current study, image-based mood presentations were added along with the word search puzzles to the manipulation, and words from the Affective Norms for English Words (ANEW; Bradley et al., 2010) were included in the word search puzzles. Developed by the same group who created the IAPS, the ANEW (Bradley et al., 2010) are a set of English words that have been rated for their emotional pleasure (positive and negative), arousal
and dominance. Similar to the IAPS, they can be used as part of experiments examining emotion and attention.

Words from the ANEW were included as an attempt to increase the effectiveness of the manipulation following the results of a pilot study (see section 3.2). However, similar results as those found in previous research were not replicated. Van Gelder et al. (2009) found that affective processing modes strengthen the relation between negative affect and risky choice, whereas cognitive processing strengthened the relation between perceived risk and risky choice. Within this study, no differences within the various risk perception measures were found between the cognitive information-processing group and the two affective information-processing groups.

In order to strengthen the impact of the three image-based presentations, standardised images from the IAPS (Lang et al., 2008) and the SUN2012 database (Xiao et al., 2010) were utilised. Images were chosen as the technique of affect manipulation as they are one of the most extensively used and effective methods within affect induction research, especially when images from the IAPS (Lang et al., 2008) are utilised (Farach, Treat, & Jungé, 2014; Leite et al., 2012; Lench, Flores, & Bench, 2011; Neumann & Lozo, 2012; Porter, ten Brinke, Riley, & Baker, 2014; Schwager & Rothermund, 2013; Zhang, Yu, & Barrett, 2014). Images from the IAPS (Lang et al., 2008) used in the positive affective and negative affective presentations were matched for arousal and valence in order to aid with consistency across the presentations. Arrays of scenes were depicted in both presentations (e.g., within the negative affective presentation, car crashes, garbage, individuals crying, cemetery, rioting, etc., and within the positive affective presentation, puppies, children, roller-coasters, athletes, etc.) in order to convey a variety of positive and negative emotions. Images were displayed for 6 seconds in line with IAPS (Lang et al., 2008) procedures.
Participants were asked to pay attention to the images, but were not asked to rate the images in terms of their valence (positive or negative) or arousal. This may have impacted how much attention participants paid to the presentations. Furthermore, the images selected from the SUN2012 database (Xiao et al., 2010) for the cognitive-based image presentation are not as extensively used throughout the literature as the IAPS (Lang et al., 2008), owing to the lack of research investigating cognitive-based manipulations. However, the cognitive images were selected from the SUN2012 database which is provided by the Princeton Vision Group and includes a large set of environmental scenes, places and objects that can be utilised in research examining human scene and object classification performance (Xiao et al., 2010).

Similar to the image-based presentations, within the two affective word search puzzles, positive affective, negative affective and neutral words were selected from the ANEW (Bradley & Lang, 2010) in order to use previous established emotive and non-emotive words. As with the images, the positive and negative words were matched for arousal and valences to help maintain consistency across the groups, and the same 15 neutral words were used across all three information-processing manipulations. For the cognitive group, the same cognitive words as had been used in previous research (van den Berg et al., 2006; van Gelder et al., 2009), and additional but similar cognitive words were included from the EAT based within the MRC Psycholinguistic Database, in order to maintain the same number of words across all three information processing groups.

As discussed in section 3.2.3, the word search puzzles were chosen due to their nature as tasks that asked participants to consider and search for words (or information), and therefore were similar to the processes which the study was aiming to manipulate. They were chosen over other tasks, such as emotional Stroop tasks or
numerical/probability tasks, due to the ability to maintain consistency across the three information processing groups for the type of task participants were being asked to complete. However, it should be noted that the word search puzzles may have activated a cognitive frame regardless of the type of words across the groups given the nature of the task. As mentioned above further research into the use of word search puzzles for manipulating information-processing modes is warranted in order to establish the exact mechanisms and information processes impacted by this specific type of task.

3.6.1.3 Limitations of study one

The study had a number of limitations that should be noted. Firstly, all participants included in this study were full time students within the college where the research was conducted. A large majority of these would have been undergraduate Psychology students, particularly junior and senior freshman due to the research credit system within the psychology department. This could raise questions about the generalizability of the results and the socioeconomic status of the sample. Secondly, the issues outlined in section 3.6.1.1 surrounding incidental versus integral affect. In this study, the information processing manipulation and the health risk information were separate components of the overall study (e.g., incidental manipulation). Future research will seek to take a more combined approach between the two, where the outcome based on the health risk information is a direct component of the manipulation (e.g., integral manipulation).

Thirdly, all measures were self-report. Fourthly, a different measure of risk perception could have been used. In previous research accessing affective and cognitive processing in terms of risk perception, some studies have included both cognitive- and affective-based measures of risk perception (Janssen et al., 2013; van den Berg et al., 2006; van Gelder et al., 2009). Issues surrounding the measures of risk perception will
be discussed further below. Finally, the sample size should be acknowledged. The initial aim of 23 participants per group was not met (see section 3.3.2.2). However, based on a visual inspection of the descriptive statistics and the lack of trends among the inferential statistical analyses measuring both information processing modes and risk perception, such was deemed to be due to a lack of effect from the manipulation rather than small sample sizes.

3.6.2 Factor analysis

Risk perception and vulnerability to risks (health risks and others) can be conceptualised and measured in a variety of different ways (French & Marteau, 2008; Johnson, Wilke, & Weber, 2004). As discussed in section 3.3.4.8, conceptually the current study based its definition of risk concepts on that of Slovic and colleagues’ risk-as-analysis and risk-as-feelings theory (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic et al., 2005), and included 13 items to measure risk perception of CVD, efficacy and understanding of the risk information. Items were chosen in order to assess the general concepts associated with risk perception, efficacy, and understanding of the risk information. Similar measures have been included in numerous studies within the body of literature assessing risk perception and efficacy for health behaviours (Brewer et al., 2007; Conner & Norman, 1995; Strecher et al., 1986; Waters, 2008) and the current items were included based on an extensive examination of such. Items were included so that risk perception beliefs such as severity, anxiety and probability of negative consequences were included as well as the basic likelihood estimates of the health hazard (Weinstein, 1998, 2000).

In a large review on incidental affect on health and life event risks, Waters (2008) concluded that positive affect resulted in more optimistic likelihood estimates of risk, compared to negative affect that are more likely to lead to more pessimistic
likelihood estimates. The author concluded that this finding was consistent and predictable across 16 studies that used a variety of affect induction methods and hazard domains, but additionally across measurement techniques. Within this study no evidence was found to support any differences between the information-processing groups in terms of the affective and cognitive information processing and their risk perception (see section 3.4.4). This was further supported by the lack differences found between the information processing groups when the data study one was re-analysed utilising the factors from the refined factor model (see section 3.5.3). Standardised measures of affective responses, and affective and cognitive-based information processing were used (e.g., NFA, NFC, PANAS-X, REI-40); however, due to the lack of standardised measures for health risk perceptions, items were chosen that were in line with those of previous research (Brewer et al., 2007; Conner & Norman, 1995; Strecher et al., 1986; Waters, 2008).

### 3.6.2.1 Theoretical implications

As discussed in section 3.5, a refined three-factor model tentatively based on the EPPM (Witte, 1992; Witte & Allen, 2000) was found to best fit the risk data from the current study. The EPPM (Witte, 1992; Witte & Allen, 2000) is similar to Slovic and colleagues’ risk-as-analysis and risk-as-feelings theory (Slovic et al., 2004, 2007; Slovic & Peters, 2006; Slovic et al., 2005) in that it places an emphasis on the affective components of risk perception, as well as the more cognitive-based aspects. Research from the risk-as-feelings perspective have shown how the affect heuristic can be utilised to guide judgments and decision-making in more timely and efficient manners (Slovic & Peters, 2006), and furthermore how such can impact information processing and in turn judgements (Slovic et al., 2000). The risk-as-analysis/risk-as-feelings theory has developed from the large body of research examining dual processing for attitude,
judgement and decision-making from the social cognitive perspective. Furthermore, the theory does not specific one particular risk within its descriptions.

Previous research on such has been applied to a number of different risks from medical, social, and financial perspectives (Bateman et al., 2007; Bohm & Pfister, 2008; De Vocht et al., 2014; Slovic et al., 2004; Slovic et al., 2005). On the other hand, the EPPM (Witte, 1992; Witte & Allen, 2000) as a theory has grown from the body of research specifically on fear appeals to health hazards and threats. The consideration of dual aspects of risk is placed more in terms of reactions to the health threat, and which type of processes (cognitive or emotional-based) the individual is more likely to take part after processing information about a health risk (Witte, 1992, 1998; Witte, 2009). A more in-depth discussion of the EPPM will be presented in section 4.1.

3.6.3 Conclusions and future research

Although no evidence was found to support the hypotheses, the current study did present a novel approach to examining an area of risk perception where investigations are lacking. As suggested above, differences were found in the immediate outcomes of the information processing manipulation and therefore future research is warranted into the use of word search puzzles as an information processing manipulation method. Results from the current study found significant differences between the information processing groups in terms of the direct outcomes of the word search puzzles, suggesting that they potentially may have an effect on affective and cognitive information processing modes. However, more in-depth investigations are needed to assess the level of this effect and if this effect could be increased in order to carry over onto other outcomes and remain for a larger amount of time.

As the effects of the information processing manipulation did not carry over to the measures of cognitive and affective information processing and risk perception,
future examinations in this thesis will aim to include a manipulation procedure where
the outcomes (information about CVD and the associated health behaviours) are a direct
component of the manipulation. Therefore, the next research study will close the gap
between the manipulation and the outcome, and will utilise a more integral, rather than
incidental, approach for the manipulation (Visschers et al., 2012; Wardman, 2006). As
the results of the factor analysis came out to tentatively support the EPPM, future
studies will utilise this theory for developing CVD risk communications to continue
examining dual processing of CVD risk perceptions. The studies discussed in chapters
four and five sought to do so and help to develop the body of literature on the EPPM for
CVD risk perception and the associated health behaviours.
Chapter 4: Testing the EPPM Among the General Population

4.1 Introduction

4.1.1 Extended Parallel Process Model (EPPM)

Growing from the diverse and inconsistent fear appeals literature, and based on Leventhal's (1970) dual framework of processing for fear communications, Witte (1992, 1994) posited the Extended Parallel Process Model (EPPM) for the cognitive and emotional mechanisms that occur in reaction to fear communications about health. The EPPM (Witte, 1992, 1994) was proposed at a time when affect was once again receiving attention within dual process theories of risk, reasoning and decision-making (Alhakami & Slovic, 1994; Epstein, 1994; Forgas, 1995; Sloman, 1996). The idea of scaring people in order to change their behaviour is not a new one and a large body of research already existed for such as a persuasive strategy in various forms of communications.

Fear appeals are defined as persuasive communications that arouse fear in order to encourage precautionary motivation and self-protective action (Rogers & Deckner, 1975). Numerous examples can be found for the use of fear appeals in communications about most diseases and health behaviours (Amonini, Pettigrew, & Clayforth, 2015; Bassett-Gunter, Latimer-Cheung, Ginis, & Castelhano, 2014; Brengman, Wauters, Macharis, & Mairesse, 2010; Ramirez et al., 1971; Stephenson & Witte, 1998; Tannenbaum et al., 2015; Wansink & Pope, 2015). However, the results are mixed and there is much debate over the application of fear alone with health messages (Kok, Bartholomew, Parcel, Gottlieb, & Fernández, 2014; Peters, Ruiter, & Kok, 2014; Peters, Ruiter, & Kok, 2013; Ruiter, Abraham, & Kok, 2001; Ruiter, Kessels, Peters, & Kok, 2014).
In response, the EPPM (Witte, 1992, 1994) was proposed as a health risk message theory encompassing three main components that interact to determine the individual’s response to a health threat: threat, efficacy and fear. According to the theory, fear is the level of emotional reaction that occurs for the individual in response to the message (e.g., “The message about CVD made me feel fearful”). Perceived threat is comprised of the perceived severity and susceptibility of the illness, and determines the extent of danger control or fear control processes that the individual will partake in (Witte, 1997). Perceived severity of the threat comprises the individuals’ thoughts around the magnitude of the threat (e.g., “CVD leads to death”), while perceived susceptibility refers to the thoughts on the risk of experiencing the threat (e.g., “I’m at risk for CVD because I smoke”). In line with the work of Slovic and colleagues (1987; 1982), the theory places an emphasis on how much of a personal threat is perceived by the individual (Witte, 1992, 1994). On the other hand, perceived efficacy relates to how effective, easy and feasible the individual believes the recommended response to the threat is. Perceived efficacy is the belief around the effectiveness of the recommended response in impeding the threat (e.g., “Eating healthily prevents CVD), and perceived self-efficacy refers to the individual’s belief in his or her own capability to carry out the recommended response (e.g., “I am able to eat healthily to prevent CVD”; Witte, 1992, 1994).

Interactions between the level of perceived threat, perceived efficacy and fear experienced by the individual in response to the health message will determine if the individual partakes in danger control or fear control processes (see Figure 4.1; Witte, 1992, 1994). In a number of investigations, Witte (1992, 1994, 1997) identified three main gaps in the fear appeals literature: a lack of consideration of processes that lead to message rejection, the role of efficacy, and the interactions between perceived threat.
and efficacy; and thus proposed the EPPM. The theory aimed to help explain not just the instances when fear appeals work, but also when they did not work, and why. Danger control processes occur when the individual perceives a high level of threat and efficacy (Witte, 1992, 1994). They acknowledge that the threat posed by the risk or hazard is high, however they also perceived high levels of efficacy around their own capability to deal with the threat and the effectiveness of those responses in averting the threat.


Danger control processes are cognitive-based and seen as incentives to change attitude, intention and behaviour, as people are consciously thinking about the threat and furthermore, the active ways that they can deal with that threat (Witte, Cameron, McKeon, & Berkowitz, 1996). The second outcome, which is possible according to the EPPM, is fear control processes. Fear control processes are more emotion-based and most likely to happen when an individual perceives a high level of threat but low levels of efficacy (Witte, 1992, 1994). They acknowledge that there is a high level of threat from the disease; however, they feel incapable of completing the recommended
response or have a lack of belief in its effectiveness to avert the threat. The individual is attempting to control the emotional reaction to the threat more and therefore does not think about the recommended responses to such. Fear control processes can take the form of defensive avoidance, denial and reactance (e.g., message derogation, perceived manipulative intent; Witte et al., 1996).

Therefore, according to Witte and colleagues (1992, 1994, 1997) the aim of any health risk communication should be to motivate the individual into danger control processes, and in turn change attitude, intention and behaviour. Danger control and fear control processes are dependent on the perception of high threat levels (Witte, 1992, 1994); however, there is a third outcome, which is possible according to the EPPM. If the individual does not perceive any threat from the disease, the theory asserts that the health threat is simply irrelevant to them and as such they do not engage or respond with the communication (Witte et al., 1996). One of the largest criticisms of the EPPM is the lack of information surrounding what occurs when there is a low threat perception (Popova, 2012; Rimal, 2001). This will be discussed below in the final section evaluating the EPPM (see section 4.1.3).

A premise of the EPPM is the effects that the combination of perceived threat of the disease and the perceived efficacy of the related health behaviour(s) can potentially have on an individual’s behaviour or behavioural intentions (Goodall & Roberto, 2008). In such, it is quite similar to a number of fear appeals theoretical frameworks and health behaviour change theories, e.g., Protection Motivation Theory (PMT; Rogers, 1983); HBM (Janz & Becker, 1984); and Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980). Furthermore as previously mentioned, a recent meta-analysis by Sheeran et al. (2014) demonstrated the significant impact of risk perceptions and appraisal on intentions and behaviours. The results of the meta-analysis found that the
greatest effect sizes for changes to intentions and behaviours were found when risk perceptions, response efficacy and self-efficacy were all increased together; of note, this premise is similar to that of the EPPM (Witte, 1992, 1994).

The EPPM builds on a large body of literature investigating fear appeals and utilised Leventhal's (1970) dual framework for a broad structure, which has been applied to both risk perceptions and other forms of health communication, e.g., patient medical decision making (Power, Swartzman, & Robinson, 2011). Similarities exist between the theories in terms of dual frameworks, and the importance given to perceptions of threat severity and personal susceptibility. Differences can be noted between the place given to perceptions of efficacy within the theory, which topic the fear appeal message is based on, emphasis of cognitive or affective based processing, and the level of interaction between perceptions of threat and those of efficacy, coping or precautionary behaviour (Manika & Gregory-Smith, 2014; Murray-Johnson et al., 2005; Ruiter et al., 2014). It should also be noted that the use of different labels for constructs that are quite similar across the different theories is problematic.

4.1.2 Applications to disease and health behaviours

With a focus on theoretically-based communications and evaluation, Witte and colleagues have applied the EPPM to a number of different diseases and health behaviours, such as teen pregnancy (Witte, 1997), skin cancer (Stephenson & Witte, 1998), HIV/AIDS (Witte, 1991; Witte, Cameron, Lapinski, & Nzyuko, 1998), and genital warts (Witte, Berkowitz, Cameron, & McKeon, 1998). Furthermore, they have utilised the theory for communications about occupation-based protective behaviours, e.g., hearing loss in coal miners (Murray-Johnson et al., 2004; Patel et al., 2001; Stephenson et al., 2005), vehicle crashes and deaths (Witte & Donohue, 2000; Witte et al., 1992) and uncertain hazards association with electromagnetic fields (McMahan,
Witte, & Meyer, 1998). All have been completed in the attempts to work out the most effective messages for presenting the right amount of threat information about a particular disease or hazard that is balanced with efficacy information about the related protective behaviours, in order to change behaviour relative to the most salient influencing factors for each disease or hazard.

The majority of the results from these preliminary examinations were consistent with the propositions of the theory (Maloney, Lapinski, & Witte, 2011; Stephenson & Witte, 1998; Witte, Berkowitz, et al., 1998). When examining the threat of genital warts and the associated protective behaviours, it was particularly highlighted that young female participants needed to initially perceive a certain level of threat for the disease before motivation to act would be initiated (Witte, Berkowitz, et al., 1998). For preventing genital warts and the associated protective behaviours, this investigation among young women provided support for the interaction between the level of perceived threat and efficacy leading to danger control or fear control processes. It should be noted though that genital warts have severe health implications for women and therefore this disease would be particularly salient for a group of younger women. A number of the studies completed by Witte and colleagues were conducted on undergraduate populations, and lacked follow-ups of the associated protective-behaviours. Thus they accessed the immediate impact of the health message, and were lacking assessment of long-term effects.

Despite such, the body of literature on the EPPM has increased and the theory authors have sought to address some of the criticisms, examine more potential influencing factors and have developed an EPPM-based measurement scale (Gould, Watt, Cadet-James, & Clough, 2015; Witte et al., 1996). Due to a number of the preliminary studies being conducted on undergraduate students, Witte and colleagues
(Murray-Johnson et al., 2005; Murray-Johnson et al., 2001; Murray-Johnson et al., 2004; Witte, Cameron, et al., 1998) conducted analyses of health education and change theories (one of which was the EPPM) for behaviour change in reproductive health among natives of Nicaragua, Nepal and Ghana and the effectiveness of EPPM-based campaign materials for HIV/AIDS prevention in Kenya. When examining reproductive health for the particular nations, it was found that the EPPM placed a particular emphasis on perceived risk and fear of consequences, versus the other health behaviour change theories (e.g., HBM, TRA and Social Cognitive Theory; Murray-Johnson et al., 2005).

Furthermore, for the Nicaraguan data, danger control and fear control processes were correlated with a number of outcome measures of reproductive health and family planning (behavioural intentions, perceived benefits, attitudes, perceived susceptibility). However, self-efficacy was not. For the Nepal data, only perceived susceptibility was found to correlate with danger control processes. Similar results were found among the Ghana data to those of Nicaragua, where danger control and fear control processes were found to correlate with barriers, benefits, perceived susceptibility and response efficacy (Murray-Johnson et al., 2005). These results in particular highlight the varying roles each of the main mechanism of the EPPM can have across cultures for similar outcomes.

As health communications do not occur within a vacuum and are susceptible to social factors and individual differences, Witte and colleagues, as well as others, have conducted a number of studies examining possible influencing factors such as repetition, stigma, collective efficacy, the varying impact of uncertainty and isolation across cultures, addition of response cost measures, and dispositional coping styles (Hullett & Witte, 2001; Rintamaki & Yang, 2014; Shi & Smith, 2016; Smith, Ferrara,
& Witte, 2007; So, 2013; Witte & Morrison, 2000). Within the last 10 years, the EPPM has been applied to large-scale primary prevention for health communication across various media platforms. Despite some debate in the literature, the media has been acknowledged as a platform where interventions targeting attitude and behaviour change can be applied at a population level (Hong, 2011). Examples can be found of investigations of television based health news in terms of EPPM components and their effectiveness (Hong, 2011; LaVoie & Quick, 2013) and a computer-based intervention for pregnancy, STD and HIV prevention among ninth-grade students (14 or 15 years of age) in the US. Even with such studies and those that will be discussed below in relation to CVD and the associated health behaviours, the body of literature on the EPPM is still under-developed in comparison to other research within health communication and particularly those examining fear appeals.

Building on Witte’s body of research, others have examined the EPPM in relation to a number of illnesses, e.g. HIV/AIDS, various cancers, stroke (Davis, Martinelli, Braxton, Kutrovac, & Crocco, 2009; Evans et al., 2012; Hubbell, 2006; Meyerowitz & Chaiken, 1987; Stephenson & Witte, 1998; Witte, 1991) and health behaviours, e.g., safe sex, drinking behaviours, reporting of influenza pandemic by hospital workers, caesarean delivery, testicular self-examination and the HPV vaccine (Balicer et al., 2010; Hajian, Shariati, Najmabadi, Yunesian, & Ajami, 2015; Hajian, Shariati, Najmabadi, Yunesian, & Ajami, 2013; Krieger & Sarge, 2013; Morman, 2000; Moscato et al., 2001; Witte, Berkowitz, et al., 1998). However, very little has been done in terms of CVD alone. Examples of research on the EPPM and the associated health behaviours for CVD that have been completed will be discussed below.

Within the literature, only two studies could be identified by the author that examined the EPPM in relation to CVD, that of McKay and colleagues (2004) and
Rimal (2001). However, it is the study conducted by McKay et al. (2004) that is cited the most within the EPPM literature. The authors sought to develop pamphlets to communicate the risks of CVD and motivational information about compliant behaviours to older adults (healthy, free-living adults aged 50+ years). In this instance the compliant behaviours were increasing the consumption of B-vitamin-rich foods and multivitamins. The participants were recruited through a two-month clinical trial of a multivitamin/mineral supplement within the US. After completion of the clinical trial, participants with an elevated plasma homocysteine concentration were randomly assigned to receive one of two messages; 1) high threat and low efficacy, or 2) high threat and high efficacy. No significant differences were found for perceived severity, susceptibility and fear (McKay et al., 2004). However, this is unsurprising as participants in both groups received the same high threat information. Significant differences were noted between the groups in terms of their attitudes and efficacy perceptions (in particular self-efficacy), where all outcomes were higher for the high-efficacy message group. In terms of danger control and fear control processes, significant differences were noted only for perceived manipulation, which was higher for the low-efficacy message group.

In terms of the population, the study focused on adults over the age of 50 years and for the protective behaviours, information was only provided on increasing the level of B-vitamin-rich foods and multivitamins in general. Thus the study was conducted on quite a specific age group and on one particular protective behaviour. As such it raises considerable questions about the generalisability of the results to other samples and in terms of more general protective behaviours. Another concern is the lack of differentiation between levels of perceived threat for the investigation (McKay et al., 2004). This is in line with the general descriptions of the EPPM for low levels of
threat perception; however, as already noted it is one of the main theoretical criticisms of the theory.

The problematic nature of such disregard for low levels of threat perception is highlighted further by the different results found in the studies completed by Rimal (2001). The author conducted four studies to assess the predictions of the EPPM at a cross-sectional and longitudinal level. In their first study examining the effects on a number of information variables related to CVD risk communications, it was found that participants who perceived a low threat of CVD risk were more likely to have lower knowledge and discussion about health issues, and less likely to take part in information-seeking behaviours. In further analyses of the data, the authors also found that when participants were high in perceived threat and had higher levels of self-efficacy, they were then more likely to think about CVD (Rimal, 2001). The rest of the studies conducted by Rimal (2001) will be discussed in more detail below under the evaluation of the EPPM as during these studies, the author sought to address three of the main theoretical criticism aimed at the EPPM: 1) interactions between threat and efficacy perceptions on outcome measures, 2) in particular, a lack of information regarding the course of those who perceive no threat from the disease, and 3) longitudinal effects of the health communications. Before providing a general evaluation of the EPPM, first a discussion of the application of such among CVD related protective behaviours will be presented.

4.1.2.1 Smoking

Due to the lack of research investigating the EPPM in terms of CVD and associated health behaviours, a number of examples discussed below are from the literature on fear appeals or are based on the relevant protective behaviours investigated in relation to other diseases. Building on the large body of research investigating fear
appeals, the EPPM has been applied to a number of anti-smoking and smoking cessation campaigns (Dijkstra & Bos, 2015; Gharlipour et al., 2015; Leshner, Bolls, & Wise, 2011; Popova, 2012; Wright, French, Weinman, & Marteau, 2006). As with much of the research on fear appeals and threatening information within health messages, the results are inconsistent (Peters et al., 2014; Peters et al., 2013; Popova, 2012; Ruiter et al., 2001). Even within the preliminary investigations of fear appeals in communications about smoking, the results were mixed. Rogers and Mewborn (1976) found after presenting detailed information about the terrible things that happen to your health if you continue to smoke, that participants responded in one of two ways. One group were found to have increased intentions to quit, while the second group responded with message derogation, and intended to smoke more after reading the message. In this instance the threatening message did more harm than good.

Some studies show that after exposure to graphic and highly threatening fear-appeals, smokers believe that smoking is less attractive (Kees, Burton, Andrews, & Kozup, 2010; Stark, Kim, Miller, & Borgida, 2008; Thrasher et al., 2007), they acknowledge higher intentions to quit (Hammond, Fong, McDonald, Brown, & Cameron, 2004) and make more calls to quit lines (Miller, Hill, Quester, & Hiller, 2009). Gharlipour et al. (2015) utilised an education programme and measures based on the EPPM to investigate an intervention to reduce smoking among male students. Differences between the groups in perceived susceptibility, perceived severity, perceived response efficacy, perceived self-efficacy, and preventive behaviour were all observed. For this particular sample (young males), it was found that increasing perceived threat within the communications results in increased levels of perceived susceptibility and severity (Gharlipour et al., 2015). However, in a study assessing threat and efficacy appraisals, fear arousal, and intention to stop smoking between an
intervention and control group in 160 smokers, Wright and colleagues (2006) found that although there was a significant difference in threat appraisal and intention to stop smoking in the next month between the groups, it was mediated by participants’ self-efficacy.

In a study investigating interactions between the EPPM and readiness to change, mixed results were found for intentions to quit smoking after participants had received a high threat message (Wong & Cappella, 2009). Participants who received a high threat and high efficacy message reported higher levels for intentions to seek help for quitting smoking, but not for actual intentions to quit. There are a number of examples of the EPPM applied to smoking behaviours across a range of platforms (Emery, Szczypka, Abril, Kim, & Vera, 2014; Gharlipour et al., 2015; Popova, 2014; Wong & Cappella, 2009; Wright et al., 2006), with most reporting effects of high threat and high efficacy on perceptions of threat and some intentions. After a recent investigation into the main propositions of the EPPM in relation to novel smokeless tobacco products, Popova (2014) called for more information and greater distinction between danger control and fear control processes as no support was found for participants taking part in message rejection when their levels of threat and efficacy were low.

4.1.2.2 Physical activity

When investigating health protective behaviours from the perspective of the EPPM, the vast majority of the research has been conducted on smoking behaviours. A couple of examples can be found for examinations into physical activity. These studies have found tentative evidence to support the impact of both threat and efficacy information on improving the likelihood of meeting physical activity guidelines (Bassett-Gunter et al., 2014; Hatchell, Bassett-Gunter, Clarke, Kimura, & Latimer-Cheung, 2013; Richards & Johnson, 2014). Furthermore, the EPPM has been used to
test the quality and accuracy of online physical activity information (Bonnar-Kidd, Black, Mattson, & Coster, 2009) and the development of large campaigns to increase exercise levels at a national scale, e.g. Michelle Obama’s health campaign “Let’s Move” (Batchelder & Matusitz, 2014). Among Canadian men who were not meeting the general physical activity guidelines, Hatchell et al. (2013) found that men who received risk information (high threat) versus those who did not receive risk information (low threat) significantly increased their physical activity at a 14 day follow up. It should be noted that the design of the study included a certain level of repetition as participants were asked to read the risk message for four consecutive days. Further investigations would need to be conducted to elucidate if the results were due to the varying levels of risk information or the effect of repetition. By concentrating on men, it would be difficult to generalise the results to women and given that the rates of physical activity are currently lower in women such investigations are warranted (Nichols et al., 2012).

Other examples can be found where the EPPM is combined with other health communication methods or theoretical frameworks to investigate the effects on various outcomes for physical activity (Bassett-Gunter et al., 2014; Richards & Johnson, 2014). In a study among participants with a family history of inactivity-related diseases (e.g., CVD, diabetes, obesity, cancer), so that their level of personal relevancy to the risk information would be high, the authors utilised EPPM constructs to measure the effect of gain- and loss-framed messages based on regular physical activity (Bassett-Gunter et al., 2014). In line with the EPPM it was found that fear was the motivating factor behind participants’ cognitive processing of the message content. In a model combing constructs from the EPPM and the TPB (Ajzen, 1987, 1991) to predict exercise intentions, it was found that among the EPPM constructs response efficacy significantly
predicted attitudes. For predictors of exercise intentions, self-efficacy and perceived susceptibility explained significant portions of the variance within the model (Richards & Johnson, 2014).

4.1.2.3 Eating healthily

There is a distinct lack of research examining diet or practices for eating healthily. This is considerably worrying given the current rising global rates of obesity and diabetes (Wild, Roglic, Green, Sicree, & King, 2004) and the impact of such on CVD outcomes (WHO, 2011). In the two examples given above for EPPM-based CVD investigations, both studies did include measures of self and response efficacy based on food consumption (e.g., shopping for own groceries, cooking own meals; McKay et al., 2004) and eating behaviours for heart healthy lifestyles (e.g., not eating red meat, using no salt, using only non-fat milk; Rimal, 2001). Napper, Harris, and Klein (2014) combined the EPPM with a self-affirmation task to motivate participants to eat more fruit and vegetables. Participants partook in a self-affirmation or control task before they received a personalised message about the risks of not eating at least five portions of fruit and vegetables a day.

Efficacy and self-affirmation alone were significant predictors of behavioural intentions (Napper et al., 2014). Additionally, interactions between threat and efficacy, and self-affirmation and efficacy also predicted intentions. However, the results of such for assessing EPPM constructs need to be interpreted with caution due to the inclusion of the self-affirmation task, as such tasks have been found to reduce defensive responding to health risks (Sherman & Cohen, 2006). It is problematic given that in attempting to explain the incidences when fear appeals do not work, the EPPM posits that individuals who perceive high threat and low efficacy may respond with such fear control processes as defensive responding and message derogation (Witte, 1992, 1994).
As with smoking and physical activity, the limited data from investigations into the effectiveness of other health communication methods (e.g., fear appeals, gain- and loss-framed messages) for improving diet and nutrition are mixed (Skilbeck, Tulips, & Ley, 1977; Wansink & Pope, 2015).

4.1.3 EPPM: Evaluation

As mentioned above, the results for the use of the EPPM and fear appeals in general within health communications are mixed. There are examples that show short-term changes for protective behaviours can be achieved particularly when campaigns are theoretically based and strategically planned (Dutta-Bergman, 2005; Snyder, 2002). Others show fear appeals impacting reactions by increasing denial, causing biased information processing and causing individuals to pay less attention to the information (Ruiter, Kessels, Peters, & Kok, 2014). However, considerable differences exist among cohorts. Health campaigns are less effective among low socioeconomic groups (Dutta-Bergman, 2005) and defensive reactions like those mentioned above are more pronounced in cohorts who are at a high level of risk for the specific health threat (Van’t Riet & Ruiter, 2013). Along with ethical questions about the level of fear and graphics used within such communications (Hastings, Stead, & Webb, 2004), these differences have caused many investigators to remain sceptical about the use of fear appeals for health communications (Witte, 1997).

In a review article, Popova (2012) highlighted that of the core propositions of the EPPM none have received complete support. Furthermore, there are inconsistencies between the level of examination given to each proposition, and due to such, certain constructs are lacking operational definitions. In particular, as mentioned already, in terms of extra processes and reactions following low levels of threat perception and the ‘critical point’ (Popova, 2012). This ‘critical point’ refers to the difference between the
levels of threat and efficacy perceived by the individual, and determines if the individual is deemed to be taking part in danger control or fear control processes (Maloney et al., 2011). Questions have also been raised over the inclusion of an individual assessment of fear, as well as perceived severity and susceptibility, following EPPM-based risk messages due to the origins of the EPPM within the fear appeals domain (Popova, 2012). A lack of consideration to other emotions, both positive and negative, and their potential impact on health perceptions and behaviours has been highlighted (Coulter & Pinto, 1995; Lewis, Watson, White, & Tay, 2007). In an examination of binge drinking, Carrera, Munoz, and Caballero (2010) found that a mixed emotional message was more effective at reducing post-message discomfort among undergraduate students, than a purely negative one. Additionally, participants who were in the mixed emotional group reported higher levels of response efficacy for drinking in moderation.

Witte and colleagues (2011) published a more recent article based on the EPPM where they sought to update the model and address some of the larger criticisms aimed at such. Additionally, Rimal (2001) noted that the inconsistent results found among the EPPM literature could potentially be due to differences in the diseases and health behaviours. This is particularly true for CVD as the development of such is the result of a complex and longitudinal set of risk factors, some of which are non-modifiable. In the most recent test of the EPPM, little evidence was found to support four of its main propositions (Ooms, Jansen, & Hoeks, 2015): 1) if efficacy and threat perceptions are high, then the individual will enter danger control process, 2) high levels of fear result in fear control process, 3) threat mediates the relationship between fear and danger control processes, and 4) the role of individual differences. The study was completed using narrative communications aimed at increasing transportation (Moyer-Gusé, 2008).
among women for breast self-examination; of note, this represents one particular cohort and a specific protective behaviour.

In an extensive examination of the EPPM in terms of CVD, Rimal (2001) sought to address the lack of operational definitions for low threat perception groups, and assigned different terms to each of the four possible groupings based on two of the main EPPM constructs: 1) high threat and high efficacy = responsive attitude, 2) high threat and low efficacy = avoidance attitude, 3) low threat and high efficacy = proactive attitude, and 4) low threat and low efficacy = indifference attitude (Rimal, 2001). Similar to other EPPM findings, high threat and efficacy perceptions resulted in greater likelihood of taking part in information seeking behaviours for CVD. The author made two particular suggestions for future health communications about CVD. The need to emphasise the negative consequences of inaction in order to encourage cognitive appraisals of the information, and going back to the basic premise of the EPPM, heightened threat perceptions must be balanced with greater efficacy perceptions, self-efficacy in particular (Rimal, 2001).

Health communications are complex, particular when attempting to cover a range of diseases or associated risk factors. Furthermore, such communications can be greatly impacted by a number of different variables, such as how the protective behaviours are perceived (Cho & Witte, 2004; Witte, 1992), the impact of emotions induced due to the message (Aaker & Williams, 1998), and previous incidental emotional states (Agrawal & Duhachek, 2010; Lerner & Keltner, 2000). In a recent meta-analysis of the effectiveness of fear appeal communications, Peters and colleagues (2013) attributed the inconsistencies found among results to flawed methodology and called for more theory-based communications within specific domains.
4.1.3.1 Comparative versus personal threat appraisals

Throughout the body of literature examining health threats, there are consistent trends across a range of diseases for higher perceptions of comparative rather than personal susceptibility to the health threat (Katapodi, Lee, Facione, & Dodd, 2004; Park & Ju, 2016; Popova & Halpern-Felsher, 2016; Sproesser, Klusmann, Schupp, & Renner, 2015). Personal susceptibility refers to the individual’s beliefs about their own likelihood of experiencing the threat, whereas comparative susceptibility are the individual’s beliefs around another’s likelihood of experiencing the same threat (Weinsten & Klein, 1995). Examples can be found across a number of different populations (Hermand, Mullet, & Rompteaux, 1999) for diabetes (Walker et al., 2007; Walker, Mertz, Kalten, & Flynn, 2003), STD/STIs (Rose & Nagel, 2013), AIDS (Fontaine, 1994), cancer (Katapodi et al., 2004) and CVD (Radcliffe & Klein, 2002; Thakkar, Heeley, Chalmers, & Chow, 2016). In particular, Rose and colleagues (2010, 2012, 2013) have done a large amount of recent work examining comparative risk perceptions for health. Their results have highlighted the direct and indirect effects of comparative perceptions for health risks and the associated outcome behaviours.

A number of examples can be found investigating comparative risk in terms of cancer (Dillard et al., 2011; Katapodi et al., 2004; Kaufman et al., 2016; Lipkus & Klein, 2006; Zajac, Klein, & McCaul, 2006; Zhao & Nan, 2016). The body of work examining such for CVD is not as extensive. Those that have assessed such report similar results for optimistic bias and higher comparative rather than personal perceptions for CVD and CHD (Aalto et al., 2007; Hevey, McGee, & Horgan, 2014; Thakkar et al., 2016). It should be noted that previous examples investigating comparative perceptions for CVD were conducted on cardiac patients. Given the large amount of evidence for optimistic bias when it comes to personal versus comparative
perceptions, it is unsurprising that the EPPM does suggest the inclusion of comparative measures of threat appraisal within the Risk Behaviour Diagnosis (RBD) scale (Witte, Meyer, & Martell, 2001). To the author’s knowledge, no study has examined if the personal and comparative measures suggested by the EPPM will produce similar results to those of other risk perception measures. The current study will seek to access such in relation to CVD and among a general population.

4.1.4 Objective and hypotheses

Due to the results of the factor analysis completed on study one tentatively supporting the EPPM (see section 3.5.1.3) and the lack of systematic testing of the EPPM particularly in terms of CVD, the objective of study two was to test EPPM-based health risk messages about CVD and the associated health behaviours among the general population. Building on the results of study one, study two aimed to examine the influence of different types of CVD information on CVD threat perceptions (e.g., personal and comparative susceptibility and severity of CVD), and efficacy perceptions for the associated health behaviours. The CVD messages and the threat and efficacy measures were all in line with EPPM constructs. Due to the change in theory from risk-as-analysis versus risk-as-feelings, there was a shift from study one to study two to more of a focus on integral affect, rather than incidental. Participants were randomly assigned to receive one of four EPPM-based CVD messages: 1) high threat and high efficacy, 2) high threat and low efficacy, 3) low threat and high efficacy, and 4) low threat and low efficacy.

Based on previous research, the following hypotheses were tested:

Hypothesis 1: Participants in the high threat, high efficacy group will be more likely than particularly those in groups two and four, to take part in danger-control processes for each of the associated health behaviours (e.g., smoking, eating healthily,
physical activity), due to high threat perceptions combined with high efficacy perceptions. Furthermore, in line with danger-control processes, they will be more likely to have higher behavioural intentions and likelihood for the associated health behaviours and less likely to take part in any message derogation or avoidance.

Hypothesis 2: Those in the high threat, low efficacy group will be more likely than those in group one to partake in fear-control processes, due to high threat perceptions and low efficacy perceptions. Furthermore, they will have lower behavioural intentions and likelihood for the associated health behaviours than those partaking in danger-control processes. Participants within this group would also be more likely to take part in message derogation and avoidance.

Hypothesis 3: Participants from the low threat, high efficacy group will be more likely than those in group four, to partake in danger-control processes. They should still perceive a threat for CVD, however it should be of a low level and the higher amount of efficacy information should encourage greater danger-control processes (e.g., high levels of efficacy perceptions for the associated health behaviours, higher levels of behavioural intentions for the associated health behaviours, and lower levels of message derogation and avoidance).

Hypothesis 4: Those from the low threat, low efficacy group are expected to take part in fear-control processes. Due to lower levels of efficacy information compared to the low threat, high efficacy group, they are more likely to have lower levels of efficacy perceptions for the associated health behaviours and therefore more likely to partake in fear-control processes. Additionally, they will have lower levels of behavioural intentions and likelihood for the associated health behaviours and possibly higher levels of message derogation and avoidance.
Hypothesis 5: Participants will report higher levels of comparative susceptibility and severity of CVD than personal susceptibility and severity.

4.2 Method

4.2.1 Design

The study was approved by the ethics committee in the School of Psychology, TCD (see Appendix A). A between-subjects design was employed with participants randomly assigned to one of four groups depending on the type of EPPM-based CVD message they received; 1) high threat and high efficacy ($n = 79$), 2) high threat and low efficacy ($n = 70$), 3) low threat and high efficacy ($n = 76$), and 4) low threat and low efficacy ($n = 80$). The study was completed online through surveygizmo.com.

4.2.2 Participants

4.2.2.1 Eligibility criteria

Three eligibility criteria were set for the study: participants had to be 18 years of age or older, capable of giving consent to participate and have a good standard of English.

4.2.2.2 Recruitment

The population for this study consisted of the student and staff bodies of TCD and University College Dublin (UCD). Recruitment and testing took place between September and November 2015, through an email campaign to a number of departments within both universities. At the time, 17,452 students were registered with TCD: 12,683 undergraduate and 4,769 postgraduate. There were 2,624 staff within TCD at the time. Furthermore, 19,623 students were registered with UCD – 12,349 undergraduate and 7,274 postgraduate, while 3,220 staff were employed by UCD.

After receiving the invitation to participate, potential participants were asked to click on the link included in the invitation email if they were happy to participate.
Participants were also invited to contact the researcher if they had any questions relating to participation before clicking on the survey link. G*Power (Faul et al., 2007) analysis revealed that for ANOVA with a statistical power of 0.80 to detect a small to medium effect size (0.20), as being significant at the .05 level a sample of 280 participants will need to be recruited. Of all the participants invited to take part in the study, 417 began participation. However, the final figures for analysis vary due to dropout (see section 4.2.6). Junior freshman on the undergraduate Psychology course in TCD received research credits for their participation by entering their email address after the debriefing sheet. Other participants did not receive any incentive or reward for their participation.

4.2.3 Materials

Variations of the CVD risk information used in study one were utilised for study two. The same CVD risk information from http://ihda.ie/, http://www.irishheart.ie, http://www.nhs.uk/Conditions/Coronary-heart-disease/, and the Changing Cardiovascular Health: National Cardiovascular Health Policy 2010-2019 published by the Department of Health and Children (2010) was used. Based on the EPPM, four different versions of the CVD risk information were created; 1) high threat and high efficacy, 2) high threat and low efficacy, 3) low threat and high efficacy, and 4) low threat and low efficacy (see Appendix M; the differences between the high and low threat and efficacy messages are underlined). The different CVD risk messages were informed from the EPPM (Witte, 1992) and previous research (Carcioppolo et al., 2013; Hall, Bishop, & Marteau, 2006; Hatchell, Bassett-Gunter, Clarke, Kimura, & Latimer-Cheung, 2013; Ordoñana, González-Javier, Espín-López, & Gómez-Amor, 2009; Popova, 2014; Wright et al., 2006). All rates of CVD included were based on Irish data, and information relating to associated health behaviours (e.g., smoking, alcohol, eating
healthily, physical activity) was taken from the *SLAN 2007: Survey of Lifestyle, Attitudes & Nutrition in Ireland: Main Report* (Morgan et al., 2008) and the *Changing Cardiovascular Health: National Cardiovascular Health Policy, 2010-2019* (Department of Health and Children, 2010).

The high threat CVD risk information contained more information relating to the susceptibility of developing CVD, in terms of the rate of CVD within the population and the associated health behaviours. Furthermore, the language used in the high threat CVD risk information was more descriptive and emotive than that included in the low threat CVD risk information. Similarly, the high efficacy information contained more information pertaining to what participants can do to reduce their chances of getting CVD, and the language was more positive in terms of how effective the health behaviours can be in reducing the chances of getting CVD.

4.2.4 Measures

4.2.4.1 Demographic characteristics, medical history and health behaviours

See section 3.3.4 for description of measures assessing demographic characteristics, medical history and health behaviours.

4.2.4.4 Risk Behaviour Diagnosis Scale

After the results of the factor analysis, the outcome questionnaire used was a self-report EPPM-based questionnaire (see Appendix N). The questionnaire asked participants to complete measures of perceived threat severity and susceptibility of CVD (questions 1 to 6), and perceived response and self-efficacy in terms of the associated health behaviours (e.g., smoking, eating healthily and being physically active; questions 7 to 24), and reactions to the CVD message (questions 25 to 28). Additional measures were included to access danger-control outcomes (e.g., intentions to complete the associated health behaviours) and fear-control outcomes from the
EPPM (Witte, 1992). These were informed by the EPPM and previous research utilising the EPPM to access risk communications (Hall et al., 2006; Ruiter, Verplanken, Kok, & Werrij, 2003; Witte, 1992; Wright et al., 2006). All measures were adopted from the RBD scale recommended in Effective Health Risk Messages: A Step-by-Step Guide (Witte et al., 2001).

The measures of perceived susceptibility and severity to CVD included assessments of both personal and comparative appraisals. All six items were measured with seven-point Likert scales, with higher scores indicating higher levels of perceived severity and susceptibility. For smoking, eating healthily and physical activity, the same six items were used to measure perceived response efficacy, self-efficacy, behavioural intentions and behavioural likelihood. The items were phrased for each of the CVD-associated health behaviours. Participants completed four measures of perceived response and self-efficacy. The four items were measured using a seven-point Likert scale, with higher scores indicating higher levels of perceived response and self-efficacy. Participants indicated their behavioural intentions and likelihood over the next month with two items. On seven-point Likert scales, higher scores from participants indicated higher intentions and likelihood of carrying out the behaviour over the next month. Participants who were not current smokers were asked not to complete the behavioural intentions and behavioural likelihood for smoking.

The last four items measure participants’ defensive avoidance, message derogation, and perceived manipulation by the CVD risk message. Participants were asked about their initial reaction to the message and whether they avoided thinking about CVD after reading the message. Furthermore, they were asked to indicate whether they believed the information was exaggerated, was trying to manipulate their feelings and if it was attempting to strain the truth; seven-point Likert scales were
utilised. For the first item higher scores indicated greater defensive avoidance. For the last three items, higher scores indicated greater levels of message derogation and perceived manipulation.

### 4.2.5 Procedure

The study was conducted online through surveygizmo.com. The first webpage to appear after participants had clicked on the survey link was the information sheet (see Appendix O). A description of the study was included, as were the participants’ rights. Participants were informed that the data would be collected anonymously through the website, that no contact details would be requested from them (except for the JF Psychology students, see section 4.2.2), and that they could withdraw from the study at any stage prior to submission of the research by exiting the webpage. In order to continue with the study, participants had to click the ‘Next’ button at the bottom of the page, which directed participants to the consent form (see Appendix D). Participants were presented with four consent questions to complete, and answering no to any of the four questions brought participants immediately to the debriefing sheet.

Following this if full consent had been given, participants were asked to complete the demographics and health questionnaire. It was stated in the information sheet to participants that the questionnaire contained questions relating to their health, and if they wished not to answer such questions, they were not obliged to. Additionally on the survey, the ‘Require Answer’ option was not used. If a response had been left blank, participants were notified of such; however, they were informed that if they had intended to leave the response blank then to please continue on with participation by clicking the ‘Next’ button at the bottom of the page.

After completion of the demographics and health questionnaire, participants were presented with one of the four EPPM-based CVD risk information descriptions.
An added logic to the webpage randomly assigned participants to one of the four groups, and presented the relevant CVD message automatically. Participants were asked to read and consider the information. After reading the CVD message, participants were asked to complete the RBD scale. Due to the number of measures within the questionnaire, it was split across five pages; 1) questions relating to CVD threat appraisals; 2) questions relating to smoking; 3) questions relating to eating healthily; 4) questions relating to physical activity; and 5) questions relating to reactions to the health information. Once participants had worked their way through the RBD scale, they were debriefed (see Appendix O), thanked for their participation, and given the contact details of the researcher should they have any questions about the study at a later date.

4.2.6 Analysis

Data were analysed with IBM SPSS Statistics (v. 23). The study was completed online and participants were not required to answer all questions due to the sensitive nature of a number of the questionnaires included in the study (e.g., personal and family history of CVD, depression, etc.). As such there was a certain amount of missing data. However, the attrition rates for the study were low (approximately 25% for most analyses). Therefore, for instances where only one item was missing from the RBD questionnaire, it was replaced with the mean of the existing similar items. This was completed for nine participants.

In line with the EPPM, participants’ overall threat perception score was computed by combining participants’ perceived personal risk, perceived personal susceptibility, perceived harm of CVD, and perceived personal severity of CVD. Participants’ perceived susceptibility was calculated from perceived personal risk and perceived personal susceptibility. Perceived severity was calculated from the perceived
harm and personal severity of CVD. Participants’ overall efficacy score for each of three health behaviours was computed by combining the first four efficacy items measuring response and self-efficacy. Response efficacy was calculated from the first two items measuring participants’ perceptions of how effective each health behaviour is at deterring and preventing CVD. Self-efficacy was calculated from perceptions about participants’ capability of carrying out the associated health behaviour and the ease of completing such.

Based on the RBD computed variable scores, it is possible to compute a discriminating value (perceived efficacy – perceived threat) for each participant and identify if participants are partaking in danger or fear control processes. From this study, three discriminating values were computed for each participant dependent on their perceived CVD threat score and their perceived efficacy score for each of the three relevant health behaviours (e.g., smoking, eating healthily, physical activity). Participants were identified as partaking in danger or fear control processes depending on whether their discrimination value was positive or negative. A positive value identified participants as taking part in danger control processes versus a negative value, which identified participants as partaking in fear control processes.

When assessing the data, it was noted that a number of variables were non-normally distributed. For such items, medians and interquartile ranges (IQRs) are presented for descriptive statistics and transformations were completed on the data for the final analyses. Reverse and Log_{10} transformations were completed where necessary as the data were predominantly found to be non-normally distributed with negative skews. In any analysis that was completed on transformed variables, descriptive statistics for significant results and trends are presented using the back-transformed means and 95% confidence intervals (Jorgensen & Pedersen, 1997).
2×2 between-groups ANOVAs were conducted to evaluate the effects of threat and efficacy on the RBD subscales, individual variables and the health information measures. Parametric analyses were conducted for all ANOVAs. In two instances, Levene’s test for homogeneity of variance was found to be significant. However, due to the robustness of ANOVA analyses, the large and consistent sample sizes, no major differences between the group’s SDs and the use of transformations for heavily skewed data, parametric versions of the two analyses were used. Chi-square analyses were conducted on danger and fear-control processes and participants’ reported family history of CVD. In order to examine the differences between personal and comparative susceptibility and severity of CVD, t-tests were conducted. All analyses were two-tailed. The alpha level for significance was set at the standard .05. Any results falling within the range of .05 to .10 were considered as trends.

4.3 Results

4.3.1 Sample characteristics

Of all the participants invited to take part in the study, 346 gave consent and began participation. See section 4.2.6 for consideration of missing data. Participants were randomly assigned to receive one of four EPPM-based CVD messages: 1) high threat and high efficacy (n = 79), 2) high threat and low efficacy (n = 70), 3) low threat and high efficacy (n = 76), or 4) low threat and low efficacy (n = 80). Demographic characteristics and health information for the sample are summarised in Table 4.1, 4.2 and 4.3, with data split across the four groups.
Table 4.1. Demographic characteristics for sample

<table>
<thead>
<tr>
<th>Demographics</th>
<th>HT + HE(^a) (n = 79)</th>
<th>HT + LE(^a) (n = 70)</th>
<th>LT + HE(^a) (n = 76)</th>
<th>LT + LE(^a) (n = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>26.37 (8.60; 24.44, 28.29)</td>
<td>26.61 (9.34; 24.37, 28.85)</td>
<td>25.53 (9.43; 23.37, 27.68)</td>
<td>26.24 (8.54; 24.33, 28.15)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13 (16.5%)</td>
<td>25 (35.7%)</td>
<td>16 (21.1%)</td>
<td>24 (30.0%)</td>
</tr>
<tr>
<td>Female</td>
<td>66 (83.5%)</td>
<td>44 (62.9%)</td>
<td>60 (78.9%)</td>
<td>55 (68.8%)</td>
</tr>
<tr>
<td>Nationality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irish</td>
<td>45 (57%)</td>
<td>44 (62.9%)</td>
<td>41 (53.9%)</td>
<td>49 (61.3%)</td>
</tr>
<tr>
<td>Non-Irish</td>
<td>12 (15.2%)</td>
<td>6 (8.6%)</td>
<td>11 (14.5%)</td>
<td>7 (8.8%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>55 (69.6%)</td>
<td>50 (71.4%)</td>
<td>61 (80.3%)</td>
<td>58 (72.5%)</td>
</tr>
<tr>
<td>Married</td>
<td>10 (12.7%)</td>
<td>13 (18.6%)</td>
<td>9 (11.8%)</td>
<td>12 (15%)</td>
</tr>
<tr>
<td>Living with partner as if married</td>
<td>12 (15.2%)</td>
<td>6 (8.6%)</td>
<td>5 (6.6%)</td>
<td>9 (11.3%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>1 (1.3%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Separated</td>
<td>-</td>
<td>-</td>
<td>1 (1.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Education Completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>-</td>
<td>-</td>
<td>1 (1.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Primary level</td>
<td>-</td>
<td>-</td>
<td>1 (1.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Secondary level</td>
<td>39 (49.4%)</td>
<td>29 (41.4%)</td>
<td>39 (51.3%)</td>
<td>37 (46.3%)</td>
</tr>
<tr>
<td>Third level</td>
<td>40 (50.6%)</td>
<td>39 (55.7%)</td>
<td>34 (44.7%)</td>
<td>41 (51.2%)</td>
</tr>
<tr>
<td>Employed Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>46 (58.2%)</td>
<td>38 (54.3%)</td>
<td>49 (64.5%)</td>
<td>51 (63.7%)</td>
</tr>
<tr>
<td>Full-time employed</td>
<td>17 (21.5%)</td>
<td>14 (20%)</td>
<td>14 (18.4%)</td>
<td>16 (20%)</td>
</tr>
<tr>
<td>Part-time employed</td>
<td>6 (7.6%)</td>
<td>5 (7.1%)</td>
<td>1 (1.3%)</td>
<td>2 (2.5%)</td>
</tr>
<tr>
<td>Stay-at-home parent</td>
<td>1 (1.3%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unemployed</td>
<td>2 (2.5%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Student + working part-time</td>
<td>7 (8.9%)</td>
<td>12 (17.1%)</td>
<td>11 (14.5%)</td>
<td>9 (11.3%)</td>
</tr>
</tbody>
</table>

\(^a\)HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

Note. Missing data is not represented; therefore figures do not equate to the total sample number or 100%.
Table 4.2

Self-reported medical history for sample

<table>
<thead>
<tr>
<th>Medical History</th>
<th>HT + HE&lt;sup&gt;b&lt;/sup&gt; (n = 79)</th>
<th>HT + LE&lt;sup&gt;b&lt;/sup&gt; (n = 70)</th>
<th>LT + HE&lt;sup&gt;b&lt;/sup&gt; (n = 76)</th>
<th>LT + LE&lt;sup&gt;b&lt;/sup&gt; (n = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>CVD: Personal History</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (5.1%)</td>
<td>-</td>
<td>2 (2.6%)</td>
<td>3 (3.8%)</td>
</tr>
<tr>
<td>No</td>
<td>75 (94.9%)</td>
<td>69 (98.6%)</td>
<td>74 (97.4%)</td>
<td>76 (95%)</td>
</tr>
<tr>
<td>CVD: Family History</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>24 (30.4%)</td>
<td>22 (31.4%)</td>
<td>28 (36.8%)</td>
<td>27 (33.8%)</td>
</tr>
<tr>
<td>No</td>
<td>55 (69.6%)</td>
<td>47 (67.1%)</td>
<td>48 (63.2%)</td>
<td>51 (63.7%)</td>
</tr>
<tr>
<td>On-going Health Issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22 (27.8%)</td>
<td>13 (18.6%)</td>
<td>22 (28.9%)</td>
<td>16 (20%)</td>
</tr>
<tr>
<td>No</td>
<td>57 (72.2%)</td>
<td>56 (80%)</td>
<td>54 (71.1%)</td>
<td>63 (78.8%)</td>
</tr>
<tr>
<td>Depression/Anxiety&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>23 (29.1%)</td>
<td>18 (25.7%)</td>
<td>20 (26.3%)</td>
<td>18 (22.5%)</td>
</tr>
<tr>
<td>No</td>
<td>56 (70.9%)</td>
<td>48 (68.6%)</td>
<td>54 (71.1%)</td>
<td>60 (75%)</td>
</tr>
<tr>
<td>Do not want to answer</td>
<td>-</td>
<td>2 (2.9%)</td>
<td>1 (1.3%)</td>
<td>1 (1.3%)</td>
</tr>
</tbody>
</table>

<sup>a</sup>For full item descriptions and the suggested amounts of exercise and alcohol consumption see Appendix H.

<sup>b</sup>HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

Note. Missing data is not represented; therefore figures do not equate to the total sample number or 100%.
Table 4.3

Health behaviour information for sample

<table>
<thead>
<tr>
<th>Health Behaviour</th>
<th>HT + HE&lt;sup&gt;b&lt;/sup&gt; (n = 79)</th>
<th>HT + LE&lt;sup&gt;b&lt;/sup&gt; (n = 70)</th>
<th>LT + HE&lt;sup&gt;b&lt;/sup&gt; (n = 76)</th>
<th>LT + LE&lt;sup&gt;b&lt;/sup&gt; (n = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Eating Habits&lt;sup&gt;a&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t pay attention</td>
<td>10 (12.7%)</td>
<td>9 (12.9%)</td>
<td>8 (10.5%)</td>
<td>8 (10%)</td>
</tr>
<tr>
<td>Healthy diet...feel guilty</td>
<td>20 (25.3%)</td>
<td>12 (17.7%)</td>
<td>18 (23.7%)</td>
<td>25 (31.3%)</td>
</tr>
<tr>
<td>Usually watch what I eat</td>
<td>39 (49.4%)</td>
<td>39 (55.7%)</td>
<td>41 (53.9%)</td>
<td>43 (53.8%)</td>
</tr>
<tr>
<td>Always watch what I eat</td>
<td>10 (12.7%)</td>
<td>6 (8.6%)</td>
<td>9 (11.8%)</td>
<td>3 (3.8%)</td>
</tr>
<tr>
<td><strong>Exercise&lt;sup&gt;a&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For the suggested amount</td>
<td>22 (27.8%)</td>
<td>18 (25.7%)</td>
<td>21 (27.6%)</td>
<td>19 (23.8%)</td>
</tr>
<tr>
<td>Less than the suggested…</td>
<td>15 (19%)</td>
<td>16 (22.9%)</td>
<td>27 (35.5%)</td>
<td>21 (26.3%)</td>
</tr>
<tr>
<td>More than the suggested…</td>
<td>32 (40.5%)</td>
<td>27 (38.6%)</td>
<td>24 (31.6%)</td>
<td>33 (41.3%)</td>
</tr>
<tr>
<td>Do not exercise</td>
<td>10 (12.7%)</td>
<td>5 (7.1%)</td>
<td>4 (5.3%)</td>
<td>6 (7.5%)</td>
</tr>
<tr>
<td><strong>Alcohol Consumption&lt;sup&gt;a&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drink the suggested amount</td>
<td>15 (19%)</td>
<td>10 (14.3%)</td>
<td>6 (7.9%)</td>
<td>10 (12.5%)</td>
</tr>
<tr>
<td>Drink more than…</td>
<td>10 (12.7%)</td>
<td>7 (10%)</td>
<td>10 (13.2%)</td>
<td>15 (18.8%)</td>
</tr>
<tr>
<td>Drink less than…</td>
<td>43 (54.4%)</td>
<td>35 (50%)</td>
<td>45 (59.2%)</td>
<td>38 (47.5%)</td>
</tr>
<tr>
<td>Do not drink alcohol</td>
<td>11 (13.9%)</td>
<td>15 (21.4%)</td>
<td>14 (18.4%)</td>
<td>14 (17.5%)</td>
</tr>
<tr>
<td><strong>Smoking Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>14 (17.7%)</td>
<td>3 (4.3%)</td>
<td>6 (7.9%)</td>
<td>9 (11.3%)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>6 (7.6%)</td>
<td>10 (14.3%)</td>
<td>13 (17.1%)</td>
<td>16 (20%)</td>
</tr>
<tr>
<td>Never smoked</td>
<td>59 (74.7%)</td>
<td>54 (77.1%)</td>
<td>57 (75%)</td>
<td>53 (66.3%)</td>
</tr>
</tbody>
</table>

<sup>a</sup>For full item descriptions and the suggested amounts of exercise and alcohol consumption see Appendix H.

<sup>b</sup>HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

Note. Missing data is not represented; therefore figures do not equate to the total sample number or 100%.
Within the whole sample there were 78 (22.5%) males and 236 (68.2%) females (missing = 32, 9.2%) and the mean age was 25.98 (SD = 8.85; 95% CI = 25.00, 26.97). For nationality, 186 (53.8%) participants identified themselves as Irish, while 40 (11.6%) participants were non-Irish (missing = 120, 34.7%). For marital status, 234 participants were single (67.6%), 44 were married (12.7%), 33 were living with their partner as if married (9.5%), one participant was separated, one was divorced and 33 participants did not declare (10.1% for divorced, separated and missing). The majority of participants had completed either to secondary level (n = 148, 42.8%) or third level education (n = 160, 46.2%). For employment status, the majority of participants were students (n = 193, 55.8%), students and working part-time (n = 39, 11.3%) or were working full-time (n = 61, 17.6%).

When reviewing the medical history for the sample, it was noted that participants reported low rates of personal CVD (less than 5.1% for all four groups) and predominately, no on-going health issues (71.1% - 80%). Additionally, participants were reporting a low rate of family history for CVD (see Table 4.2). Due to such, a chi-square goodness of fit test revealed a significant difference in the rates of reported family history for CVD than would be expected from the population (sample % = 33.3% vs. expected population % = 50%), $\chi^2 (1, 312) = 34.67, p < .001$. Approximately, two-thirds of each group reported that they did not have a history of depression and/or anxiety (68.6% - 75%).

From participants’ self-reported health behaviour activities, it was found that for the four message groups, over half of each (49.4% - 55.7%) reported that they usually paid attention to their diet, but they liked to treat themselves. The vast majority of participants took part in some form of exercise, with low rates of no exercise reported (below 12.7% across all four groups). However, it was not possible to determine any
patterns for the different levels of exercise completed. Most participants (47.5% - 59.2%) reported that they drank less than the suggested amount (see Appendix H). The majority of participants were ex-smokers or reported that they had never smoked. Never smoked, in particular, was between 66.3% and 77.1% across the four groups.

4.3.2 Descriptive statistics

4.3.2.1 RBD scale: Threat

Descriptive statistics for the individual and computed RBD scale items measuring threat that were normally and non-normally distributed are presented in Table 4.4, with the data split across the four EPPM-based groups. For descriptive statistics of the individual items of the computed variables see Appendix P. After dealing with missing data, the numbers of the four EPPM-based groups were as follows: 1) high threat and high efficacy (n = 64), 2) high threat and low efficacy (n = 61), 3) low threat and high efficacy (n = 69), or 4) low threat and low efficacy (n = 74).

Table 4.4

Descriptive statistics for threat measures from the RBD scale from sample

<table>
<thead>
<tr>
<th>CVD Threat Measures</th>
<th>HT + HE(^a) (n = 64)</th>
<th>HT + LE(^a) (n = 61)</th>
<th>LT + HE(^a) (n = 69)</th>
<th>LT + LE(^a) (n = 74)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparative</td>
<td>M (SD: 4.63 (1.42); 95% CI 4.27, 4.98)</td>
<td>M (SD: 4.80 (1.61); 95% CI 4.39, 5.22)</td>
<td>M (SD: 4.70 (1.43); 95% CI 4.35, 5.04)</td>
<td>M (SD: 5.05 (1.38); 95% CI 4.73, 5.37)</td>
</tr>
<tr>
<td>susceptibility</td>
<td>4.27, 4.98 (3.19)</td>
<td>4.39, 5.22 (2.84)</td>
<td>4.35, 5.04 (3.04)</td>
<td>4.73, 5.37 (3.18)</td>
</tr>
<tr>
<td>Computed</td>
<td>7.69, 9.28 (7.77, 9.22)</td>
<td>Mdn (IQR(^b): 7.77, 9.22)</td>
<td>8.47, 9.93 (8.26, 9.74)</td>
<td>8.26, 9.74 (8.00, 9.50)</td>
</tr>
<tr>
<td>Computed severity</td>
<td>7.00 (6.00 - 7.00)</td>
<td>7.00 (6.00 - 7.00)</td>
<td>7.00 (5.00 - 7.00)</td>
<td>7.00 (5.00 - 7.00)</td>
</tr>
<tr>
<td>Computed threat</td>
<td>22.00 (18.25 - 25.00)</td>
<td>22.00 (18.00 - 24.00)</td>
<td>23.00 (20.00 - 25.00)</td>
<td>23.00 (19.00 - 25.00)</td>
</tr>
</tbody>
</table>

\(^a\)HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

\(^b\)Interquartile Range
4.3.2.2 RBD scale: Efficacy

Participants were asked the same six items measuring response efficacy, self-efficacy and behavioural intentions for smoking, eating healthily and exercise. All data for the associated health behaviours were non-normally distributed, except for the behavioural intention items for smoking.

However, it should be noted that due to the applicability of such items the data from participants who identified as ‘never smoked’ were removed, therefore reducing the sample number. Descriptive statistics for the computed efficacy variables and individual behavioural intentions items are presented in Tables 4.5 for normally distributed variables and Table 4.6 for those that were non-normally distributed, with the data split across the four EPPM-based groups.

Table 4.5

Descriptive statistics for normally distributed efficacy measures from the RBD scale from sample

<table>
<thead>
<tr>
<th>Efficacy Measures</th>
<th>HT + HE$^a$ (n = 12)</th>
<th>HT + LE$^a$ (n = 10)</th>
<th>LT + HE$^a$ (n = 13)</th>
<th>LT + LE$^a$ (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioural intentions</td>
<td>4.42 (1.98; 3.16, 5.67)</td>
<td>4.40 (1.71; 3.18, 5.63)</td>
<td>4.62 (1.50; 3.71, 5.52)</td>
<td>3.57 (1.43; 2.92, 4.22)</td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>3.16 (5.67)</td>
<td>3.18 (5.63)</td>
<td>3.71 (5.52)</td>
<td>2.92 (4.22)</td>
</tr>
<tr>
<td></td>
<td>4.00 (1.91; 2.79, 5.21)</td>
<td>4.50 (1.78; 3.23, 5.77)</td>
<td>3.77 (1.48; 2.87, 4.66)</td>
<td>3.52 (1.66; 2.77, 4.28)</td>
</tr>
</tbody>
</table>

$^a$HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

Note. For smoking behavioural intentions and likelihood, participants who identified as ‘never smoked’ were removed.
Table 4.6

Descriptive statistics for non-normally distributed efficacy measures from the RBD Scale from sample

<table>
<thead>
<tr>
<th>RBD Scale: Efficacy Measures</th>
<th>HT + HE&lt;sup&gt;a&lt;/sup&gt;</th>
<th>HT + LE&lt;sup&gt;a&lt;/sup&gt;</th>
<th>LT + HE&lt;sup&gt;a&lt;/sup&gt;</th>
<th>LT + LE&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mdn (IQR&lt;sup&gt;b&lt;/sup&gt;)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>12.00 (10.00 – 14.00)</td>
<td>12.00 (10.25 – 14.00)</td>
<td>11.00 (8.00 – 13.00)</td>
<td>12.00 (9.00 – 13.00)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>10.00 (8.00 – 12.00)</td>
<td>9.50 (8.00 – 13.00)</td>
<td>10.00 (8.00 – 13.00)</td>
<td>9.00 (7.00 – 12.00)</td>
</tr>
<tr>
<td>Perceived efficacy</td>
<td>22.00 (19.00 – 24.75)</td>
<td>22.00 (19.25 – 24.75)</td>
<td>21.00 (17.00 – 24.00)</td>
<td>21.00 (16.00 – 24.00)</td>
</tr>
<tr>
<td>Eating healthily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>12.00 (11.00 – 14.00)</td>
<td>12.00 (11.00 – 14.00)</td>
<td>12.00 (10.00 – 13.25)</td>
<td>12.00 (10.75 – 13.00)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>12.00 (10.00 – 13.00)</td>
<td>10.00 (8.00 – 13.00)</td>
<td>11.00 (8.75 – 12.00)</td>
<td>11.00 (8.75 – 12.00)</td>
</tr>
<tr>
<td>Perceived efficacy</td>
<td>24.00 (20.00 – 26.00)</td>
<td>22.50 (19.25 – 25.00)</td>
<td>22.00 (20.00 – 25.00)</td>
<td>22.00 (20.00 – 25.00)</td>
</tr>
<tr>
<td>Behavioural intentions</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (5.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>6.50 (5.00 – 7.00)</td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (4.25 – 7.00)</td>
<td>6.00 (4.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>13.00 (11.00 – 14.00)</td>
<td>12.00 (11.00 – 14.00)</td>
<td>12.00 (11.00 – 14.00)</td>
<td>12.00 (11.00 – 14.00)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>12.00 (10.00 – 13.00)</td>
<td>12.00 (9.00 – 13.75)</td>
<td>12.00 (10.00 – 13.00)</td>
<td>11.50 (9.00 – 13.00)</td>
</tr>
<tr>
<td>Perceived efficacy</td>
<td>24.00 (21.00 – 27.00)</td>
<td>23.00 (21.00 – 26.00)</td>
<td>24.00 (22.00 – 26.00)</td>
<td>23.00 (21.00 – 25.00)</td>
</tr>
<tr>
<td>Behavioural intentions</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (5.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (5.75 – 7.00)</td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (5.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
</tr>
</tbody>
</table>

<sup>a</sup>HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

<sup>b</sup>Interquartile Range
4.3.2.3 RBD scale: Message derogation

Participants were also asked four questions regarding their reactions to the CVD risk information to access for message derogation (e.g., first reactions, truth of the information, etc.). The descriptive statistics for such are presented in Table 4.7, with the data split across the four EPPM-based groups.

Table 4.7

Descriptive statistics for message derogation measures from the RBD Scale

<table>
<thead>
<tr>
<th>Message Derogation Measures</th>
<th>HT + HE(^a) (n = 56)</th>
<th>HT + LE(^a) (n = 55)</th>
<th>LT + HE(^a) (n = 65)</th>
<th>LT + LE(^a) (n = 68)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First reaction</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
</tr>
<tr>
<td></td>
<td>3.63 (1.88; 3.12, 4.13)</td>
<td>3.46 (1.86; 2.95, 3.96)</td>
<td>3.86 (1.78; 3.42, 4.30)</td>
<td>3.57 (1.95; 3.10, 4.05)</td>
</tr>
<tr>
<td>Exaggerated</td>
<td>Mdn (IQR(^b))</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
</tr>
<tr>
<td></td>
<td>2.00 (1.00 - 3.00)</td>
<td>3.00 (1.00 - 4.00)</td>
<td>2.00 (1.00 - 3.00)</td>
<td>2.00 (1.00 - 4.00)</td>
</tr>
<tr>
<td>Manipulating feelings</td>
<td>3.00 (1.00 - 4.00)</td>
<td>3.00 (1.00 - 4.00)</td>
<td>3.00 (1.00 - 4.00)</td>
<td>3.00 (1.00 - 4.00)</td>
</tr>
<tr>
<td>Strained the truth</td>
<td>2.00 (1.00 - 3.75)</td>
<td>3.00 (1.00 - 4.00)</td>
<td>2.00 (1.00 - 4.00)</td>
<td>2.00 (1.00 - 4.00)</td>
</tr>
</tbody>
</table>

\(^a\)HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

\(^b\)Interquartile Range

4.3.3 Associations between EPPM message groups and control processes

In order to access the first expectations of hypotheses one to four, chi-square analyses were conducted to establish if any associations existed between the EPPM message groups and whether participants were deemed to be partaking in danger or fear control processes for each of the associated health behaviours (e.g., smoking, eating healthily and physical activity). This was done in line with Witte et al.’s (2001) proposed calculations for EPPM and RBD scale outcomes, see section 4.2.6 for how the discriminating variable for danger or fear control processes was calculated. No significant associations were noted for eating healthily and physical activity (see Appendix Q). However, it was found that the association between the EPPM-based
message groups and whether participants were partaking in danger- or fear-control processes for smoking was approaching significant, $\chi^2 (3, 257) = 6.58, p = .087$. A greater proportion of participants in the low threat groups, regardless of high or low efficacy, were found to be partaking in fear-control processes versus danger-control processes, see Table 4.8 for breakdown across the groups.

Table 4.8

<table>
<thead>
<tr>
<th>EPPM Message Group</th>
<th>Control Processes (Smoking)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Danger-control</td>
<td>Fear-control</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>High threat, high efficacy</td>
<td>30 (11.7%)</td>
<td>30 (11.7%)</td>
<td>60 (23.3%)</td>
<td></td>
</tr>
<tr>
<td>High threat, low efficacy</td>
<td>29 (11.3%)</td>
<td>27 (10.5%)</td>
<td>56 (21.8%)</td>
<td></td>
</tr>
<tr>
<td>Low threat, high efficacy</td>
<td>22 (8.6%)</td>
<td>45 (17.5%)</td>
<td>67 (26.1%)</td>
<td></td>
</tr>
<tr>
<td>Low threat, low efficacy</td>
<td>28 (10.9%)</td>
<td>46 (17.9%)</td>
<td>74 (28.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>109 (42.4%)</td>
<td>148 (57.9%)</td>
<td>257 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

4.3.4 Threat and efficacy appraisals, and message derogation

Following on from the above results, to test the second set of expectations from hypotheses one to four, 2×2 between-groups ANOVAs were conducted to evaluate if any differences existed between the EPPM message groups, depending on the levels of threat and efficacy information included in such, for CVD threat appraisal and efficacy appraisals of the associated health behaviours. Analyses were also conducted on the message derogation measures due to their association with partaking in fear-control processes. Analyses of interest and those with significant results are described below, see Appendix R for additional analyses.

4.3.4.1 CVD threat

Levene’s test of equality of variance indicated that there was homogeneity of variance ($F = 0.97, p = .410$). The results of the 2×2 between-subjects ANOVA revealed a significant main effect of threat ($F_{(1, 264)} = 4.69, p < .05$, partial $\eta^2 = .02$) on participants’ transformed perceived threat of CVD, where the high threat group ($M =$
22.25, 95% CI = 21.55, 22.88) reported lower perceived threat than the low threat group (M = 23.29, 95% CI = 22.60, 23.90). There was no significant main effect of efficacy (F(1, 264) = 0.25, p = .617, partial η² < .00) and no interaction effect (F(1, 264) = 0.07, p = .796, partial η² < .00), see Figure 4.2.

Figure 4.2. Line graph of group means (back-transformed) for perceived threat of CVD across the four groups. Note. Error bars are based on standard error.

In order to further explore the above significant main effect of threat, two 2×2 between-subjects ANOVAs were conducted on participants’ computed perceived severity and susceptibility. Perceived severity was transformed and perceived susceptibility was found to be suitable for parametric analysis on the original data. No significant main effects or interactions were noted for perceived susceptibility and severity of CVD (see Appendix R).

4.3.4.2 Smoking efficacy

For participants, perceived efficacy for smoking (transformed), Levene’s test of equality of variance indicated that there was homogeneity of variance (F = 0.13, p = .942). The results of the 2×2 between-subjects ANOVA revealed a trend towards a
significant main effect of threat \( F(1, 253) = 2.95, p = .087, \) partial \( \eta^2 = .01 \) on participants’ transformed smoking perceived efficacy, where the high threat group (\( M = 22.99, 95\%CI = 22.13, 23.74 \)) reported higher perceived efficacy for smoking than the low threat group (\( M = 21.97, 95\%CI = 21.07, 22.76 \)). There was no significant main effect of efficacy \( F(1, 253) = 0.21, p = .643, \) partial \( \eta^2 = .00 \). Similarly, there was no interaction effect \( F(1, 253) = 0.20, p = .655, \) partial \( \eta^2 = .00 \), see Figure 4.3.

![Figure 4.3. Line graph of group means for smoking perceived efficacy (back-transformed) across the four groups. Note. Error bars are based on standard error.](image)

In order to better understand the above result, two 2×2 between-groups ANOVAs were run on participants’ response and self-efficacy (both transformed). It was found that the above trend towards a significant main effect for perceived efficacy was occurring due to a significant main effect of threat for participants’ response efficacy \( F(1, 253) = 7.56, p < .01, \) partial \( \eta^2 = .03 \), where the high threat group (\( M = 12.34, 95\%CI = 11.96, 12.68 \)) reported higher smoking response efficacy than the low threat group (\( M = 11.58, 95\%CI = 11.12, 11.98 \)). No other significant main effects or interactions were noted for response and self-efficacy for smoking (see Appendix R).
Analyses were also conducted on participants’ behavioural intentions and likelihood for quitting or refraining from smoking over the next month. It should be noted that only participants who identified as current or ex-smokers were included in the analyses, and therefore the sample numbers were reduced: 1) high threat and high efficacy \( (n = 12) \), 2) high threat and low efficacy \( (n = 10) \), 3) low threat and high efficacy \( (n = 13) \), and 4) low threat and low efficacy \( (n = 21) \). No significant main effects or interactions were noted for behavioural intentions or likelihood (see Appendix R).

**4.3.4.3 Eating healthily efficacy**

For perceived efficacy for eating healthily (transformed), the sample sizes were as follows: 1) high threat and high efficacy \( (n = 59) \), 2) high threat and low efficacy \( (n = 56) \), 3) low threat and high efficacy \( (n = 66) \), and 4) low threat and high efficacy \( (n = 70) \). The results of the analysis revealed a significant main effect of threat \( (F(1, 247) = 5.42, p < .05, \text{partial } \eta^2 = .02) \) on participants’ eating healthily perceived efficacy, where the high threat group \( (M = 23.87, 95\% \ CI = 23.09, 24.54) \) reported higher perceived efficacy than the low threat group \( (M = 22.73, 95\% \ CI = 22.07, 23.32) \). There was no significant main effect of efficacy \( (F(1, 247) = 0.12, p = .734, \text{partial } \eta^2 < .00) \), and there was no significant interaction effect \( (F(1, 247) = 0.02, p = .885, \text{partial } \eta^2 < .00) \), see Figure 4.4.

Further analyses on participants’ response and self-efficacy (reverse and \( \log_{10} \) transformations on both variables) did not produce any significant main effects or interactions. However, there was a trend towards significance for the main effect for threat for participants’ self-efficacy \( (p = .060) \), where the high threat group \( (M = 11.46, 95\% \ CI = 10.96, 11.91) \) reported higher self-efficacy than the low threat group \( (M = 10.83, 95\% \ CI = 10.36, 11.25) \).
4.3.4.4 Physical activity efficacy

A $2 \times 2$ between-groups ANOVA was conducted to evaluate the effects of threat and efficacy information levels on participants’ perceived efficacy for physical activity (transformed). No significant main effects or interaction were noted (see Appendix R).

Further analyses on participants’ behavioural intentions and likelihood for physical activity in the next month (both transformed), revealed no significant main effects or interaction for participants’ behavioural likelihood (see Appendix R). For participants’ behavioural intentions, the Levene’s test of equality of variance indicated
that there was not homogeneity of variance \((F = 7.80, p < .01)\), however as outlined in section 4.2.6 a parametric analysis was completed.

The results of the ANOVA analysis revealed no significant main effect of threat \((F_{(1, 245)} = 0.16, p = .689, \text{ partial } \eta^2 = .00)\) on participants’ behavioural intentions to exercise in the next month. There was a significant main effect of efficacy \((F_{(1, 245)} = 5.75, p < .05, \text{ partial } \eta^2 = .02)\), where the high efficacy group \((M = 6.73, 95\% \text{ CI} = 6.62, 6.84)\) reported higher intentions to exercise than the low efficacy group \((M = 6.50, 95\% \text{ CI} = 6.34, 6.65)\). There was no interaction effect \((F_{(1, 245)} = 0.10, p = .750, \text{ partial } \eta^2 < .00)\), see Figure 4.5.

![Figure 4.5](image)

*Figure 4.5.* Line graph of group means for behavioural intentions for partaking in exercise in the next month (back-transformed) across the four groups. *Note.* Error bars are based on standard error.

### 4.3.4.5 Message derogation

Participants were asked four questions relating to the EPPM-based CVD messages in order to access message derogation, avoidance and perceived manipulation by the message, as these are associated with fear-control processes.
2×2 between-groups ANOVAs were conducted on each of the four items. Analyses on participants’ reaction to the information were completed on the original data; however, the three other items (if participants believed the information had been exaggerated, if participants believed that the information was trying to manipulate their feelings and if participants believed that the information was attempting to strain the truth) were transformed using a reverse and \( \log_{10} \) transformation due non-normally distributed data with a negative skew.

No significant main effects or interactions were noted on the four items (see Appendix R). However, the interaction between threat and efficacy for participant beliefs that the information had been exaggerated was approaching significance \((p = .059)\).

### 4.3.5 Personal and comparative susceptibility and severity of CVD

In order to examine if any differences existed between participants personal and comparative susceptibility for CVD and to test hypothesis five, two within-groups \( t \) tests were conducted. Variables were analysed as a whole, irrespective of which message group participants have been randomly assigned to. Descriptive statistics are presented in Table 4.9.

Table 4.9

<table>
<thead>
<tr>
<th>Personal and Comparative Susceptibility and Severity</th>
<th>Descriptive Statistics</th>
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<tr>
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<td>( n )</td>
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<tr>
<td>Personal susceptibility</td>
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<td>Comparative susceptibility</td>
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<td>Personal severity</td>
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<td>Comparative severity</td>
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On average, participants reported significantly lower personal susceptibility \((M = 4.36, SD = 1.73, 95\% CI = 4.15, 4.57)\) than comparative susceptibility \((M = 4.80, SD = 1.46, 95\% CI = 4.63, 4.98)\), \(t(267) = -4.10, p < .001, r = 0.24\). Additionally, a within-groups t-test was conducted to examine the difference between participants’ personal and comparative severity for CVD. Both variables were transformed using a reflected and Log\(_{10}\) transformation, due to the data being non-normally distributed with negative skews. Descriptive statistics are presented in Table 4.9. No significant difference was found between participants’ personal severity and their comparative severity of CVD, \(t(267) = -1.60, p = .112, r = 0.10\).

4.3.6 Summary of results

4.3.6.1 EPPM

The results from the chi-square and ANOVA analyses provided little evidence to support the EPPM, and therefore hypotheses one to four were not supported. An association was found between the low threat groups and fear-control processes from their CVD threat appraisals and smoking efficacy. Participants in the low threat groups, irrespective of the level of efficacy information they received, were partaking in more fear-control processes than danger-control processes in relation to smoking. These findings do partially support hypothesis four; however, given the lack of effect from the level of efficacy information none of the hypotheses can be fully supported. Further investigations revealed that there was a significant difference between the high and low threat groups for smoking response efficacy, but not self-efficacy, where the high threat group reported higher smoking response efficacy than the low threat group. For fear-control processes, no evidence was found of any differences between the message groups for message derogation.
4.3.6.2 Threat appraisals of CVD

For threat appraisals of CVD, a difference was found between the threat groups in terms of their overall perceived threat of CVD; however, it was in the opposite direction to what was expected in accordance with all four hypotheses. The high threat groups (irrespective of the level of efficacy information they received) reported lower perceived CVD threat than the low threat groups.

Overall, the sample reported higher comparative susceptibility than personal susceptibility for CVD. The same difference was not seen for participants’ severity perceptions for CVD, therefore hypothesis five was partially supported.

4.3.6.3 Efficacy appraisals for the associated health behaviours

A significant difference between the high and low threat groups was found in terms of participants’ perceived efficacy for eating healthily, where those in the high threat group reported higher perceived efficacy. The result appeared to be occurring more so due to differences in participants’ perceived self-efficacy for eating healthily, rather than response efficacy. For participants’ physical activity behavioural intentions, it was found that participants who received the high efficacy information were more likely to report higher intentions to exercise in the next month. Therefore, hypotheses one and three are given some support in terms of eating healthily and physical activity.

4.4 Discussion

The lack of general findings, and in particular, the lack of interaction effects from the analyses means that none of the four hypotheses based on the EPPM were fully supported. There is some support for differences between the high and low threat groups. However, most are in the opposite direction to the model propositions and therefore in general, the study found little evidence to support the EPPM for communicating CVD risks and efficacy information about the associated health
behaviours. There are several factors that need to be highlighted when considering these results, as discussed in the following sections.

4.4.1 Theoretical implications

4.4.1.1 Threat appraisals

Investigations in the past have considered the EPPM in relation to a number of different disease and health behaviours (Stephenson & Witte, 1998;orman, 2000; Moscato et al., 2001; Witte, Berkowitz, et al., 1998); however, as highlighted in section 4.1 very little has been done in terms of CVD (McKay et al., 2004). In comparison to the use of the EPPM by McKay et al. (2004) for communicating CVD risks, this study accessed a younger population, included a wider range of associated health behaviours and investigated the difference between varying levels of threat and efficacy information. Threat appraisals have been shown to impact risk perceptions for diseases and can in turn become motivating factors for partaking in protective health behaviours (Vernon, 1999). From the current analysis, a difference was observed between the groups in their CVD perceived threat; however, it was in the opposite direction than expected and the lack of difference between the efficacy groups and no interaction effects raises questions about the effectiveness of these EPPM-based messages in this context.

Previous research examining health risks has shown that individuals can react defensively when presented with a health threat (Epton, Harris, Kane, van Koningsbruggen, & Sheeran, 2015; Harris & Napper, 2005). The current findings would seem to suggest a rebound effect among participants in the high and low threat groups. The EPPM (Witte, 1992; Witte, 2009; Witte et al., 2001) would posit that defensive reactions to a health threat message would result in message derogation and in turn, fear control processes, but the current study found no evidence to support such.
In the current study, it appeared that providing participants with higher levels of risk information about CVD reduced their subsequent threat appraisals. According to the SRMI (Cameron & Chan, 2008; Leventhal, Brissette, & Leventhal, 2003) after receiving information about a health threat, individuals make attempts to build mental representations of such.

Initial emotional responses such as fear and anxiety can motivate the individual to partake in more cognitive-based and adaptive processes, such as emotional suppression, low avoidance, cognitive changes and proactive behaviours (Rus & Cameron, 2016). Unlike the EPPM, the SRMI places an emphasis on the parallel workings of cognitive and affective information processing in reaction to a health threat, and the impact one can have on another, potentially impacting threat perceptions (Lee, Cameron, Wunsche, & Stevens, 2011). Negative emotional reactions can motivate the individual to partake in emotional regulation strategies, such as seeking social support or cognitive processes to re-establish a positive self-concept (Rus & Cameron, 2016).

As discussed in section 1.2.1.1, previous research has provided support for the impact of SRMI constructs on outcomes following MI and smoking behaviour (Browning et al., 2009; Petrie et al., 1996). In the current investigation, it is possible that participants who received more CVD threat information were motivated to take part in more emotional regulation processes, than those who received low levels of CVD threat information, and therefore reported lower self-reported threat appraisals for CVD. Future research may consider including an emotion regulation task (e.g., emotional disclosure through writing) or a self-affirmation task in order to reduce the possible effects of such on participants’ processing of the health threat information (Cameron & Jago, 2008; Harris & Epton, 2009, 2010). By promoting participants’
reflection on the cherished values or attributes of their lives (e.g., self-affirmation task; McQueen & Klein, 2006; Sherman & Cohen, 2006) or encouraging thinking about both the thoughts and feelings associated with the health threat (e.g., self-regulation writing intervention; Cameron & Nicholls, 1998), previous research has found that adjustment to the health threat can be encouraged. Therefore, individuals’ are less likely to experience illness-related distress and more likely to partake in cognitive, problem-focused processing of the health threat (Cameron & Jago, 2008).

According to the EPPM (Witte, 1992), perceived threat is comprised of perceived susceptibility and severity of the illness. The CVD health messages within this study sought to manipulate both by varying the emphasis on the rates of CVD and the type of language used (e.g., more emotive and vivid for the high threat group) as has been done in previous EPPM-based research (Witte, 2009). Furthermore, participants’ perceived severity and susceptibility were accessed utilising measures developed from the RBD scale (Witte, Meyer, & Martell, 2001). The difference in participants’ perceived threat was found to predominantly be due to a difference in their perceived susceptibility for CVD, rather than perceived severity. It should be noted that participants did in general report high levels of CVD severity. The manipulation in the levels of threat information impacted perceptions about the risks of experiencing CVD and not the magnitude of CVD as a disease, similar to the results of Murray-Johnson et al. (2005). However, this impact was in the opposite direction to that of other previous research (Gharlipour et al., 2015; Richards & Johnson, 2014). As discussed above, this result could be due to a rebound effect among participants and defensive reactions in relation to the higher threat information included about the levels of CVD among the general population in the high threat messages.
In terms of general risk perceptions, a difference was found between personal and comparative susceptibility perceptions among the sample. Similar to the finding discussed above in relation to the EPPM-based threat appraisals, the difference was found in participants’ risk perceptions about getting CVD, but not in terms of the severity of experiencing CVD. The results reflect a general trend within the literature on risk perception for optimistic bias, in that individuals regularly do not perceive themselves to be at as much of a risk compared to others (Buunk & Gibbons, 1997; Price, Pentecost, & Voth, 2002; Weinstein, 1984; Weinstein & Klein, 1995). Optimistic bias in terms of personal versus comparative risk estimates have been found across a number of health outcomes (Katapodi et al., 2004; Park & Ju, 2016; Popova & Halpern-Felsher, 2016; Sproesser et al., 2015; Weinstein, 1987), including CVD (Hevey et al., 2014; Radeliffe & Klein, 2002; Thakkar et al., 2016; Webster & Heeley, 2010).

From this study it was found that individuals perceived themselves to be at less of a risk of experiencing CVD than others of a similar age and gender; however, they did not believe that the magnitude of experiencing CVD was any less for themselves in comparison to others. These findings highlight the importance of including comparative estimates when examining CVD threat appraisals, such as measures asking participants to access the risk of an individual of the same age and gender as them developing the health risk. However, more investigations are warranted to elucidate the specific instances in which differences between personal and comparative estimates occur for CVD threat appraisals.

In their review of moderators of optimistic bias, Helweg-Larsen and Shepperd (2001) assessed positive and negative moods, as well as perceived control and prior experience, for affecting personal and/or target risk estimates. They highlighted that negative moods appeared to affect personal risk perceptions more, whereas positive
moods affect target risk perceptions. In particular, the authors discussed how encouraging participants to think about their personal risk-related behaviours affected their personal risk estimates, where participants had a tendency to focus on their protective health behaviours and in turn, report lower personal risk estimates (Helweg-Larsen & Shepperd, 2001). A more in-depth discussion of this issue is presented in chapter seven.

**4.4.1.2 Smoking**

Despite the lack of results for perceived CVD threat, the study did find that participants who received high CVD threat information reported greater perceived efficacy in terms of smoking than those who received the low CVD threat information; this result is in line with other examples from previous research (Emery et al., 2014; Wong & Cappella, 2009). Efforts were made when developing the CVD messages to include both self and response efficacy information in relation to each health behaviour, in line with previous EPPM-based messages (McKay et al., 2004; Witte, 1992; Witte, 2009). The result was found to be predominantly in terms of participants’ response efficacy, rather than self-efficacy, in terms of smoking. In an examination of the EPPM and reactance theory for pictorial health warnings labels on cigarette packaging, Thrasher et al. (2007) found results different to that of the current study, as self-efficacy in particular was associated with more adaptive responses such as attempting to quit smoking.

Participants who received more threat information about CVD, and more descriptive and emotive threat information reported higher agreement with statements that refraining from or quitting smoking helped to prevent and deter CVD. Furthermore, when investigating whether participants were partaking in danger or fear control processes, the chi-square analysis for smoking found that there was a higher proportion
of participants from the low threat groups using fear-control processes. When participants threat appraisals for CVD where combined with their efficacy appraisals for smoking, participants in the lower threat groups were more likely to partake in more fear-control processes than danger-control processes.

As with other investigations utilising the EPPM in relation to health behaviours, the results from this study are somewhat inconsistent (Gharlipour et al., 2015; Wright et al., 2006). As suggested above for participants’ threat appraisals, the SRMI may provide a better explanation for the current findings. A key premise of the SRMI is the combined interacting effect of threat appraisals and beliefs about protective behaviours on risk perceptions and motivation for partaking in health behaviours (Bishop, Marteau, Hall, Kitchener, & Hajek, 2005; Cameron, 2008; Leventhal et al., 2003). The inconsistent finding for CVD threat appraisals from the low threat groups, when combined with individuals smoking efficacy appraisals, may have resulted in individuals’ greater likelihood for fear control processes.

### 4.4.1.3 Eating healthily

Similar to the results above for smoking, a significant difference between the high and low threat groups was found in terms of participants’ perceived efficacy for eating healthily, where those in the high threat group reported higher perceived efficacy. However, unlike that for smoking, it appeared that the difference was occurring more so due to a difference in participants’ perceived self-efficacy for eating healthily rather than their perceived response efficacy. The finding is similar to that of Napper and colleagues (2014) who found that threat appraisal alone could predict intentions to eat more healthily. The lack of significant effects of the efficacy information included for eating healthily in the EPPM-based CVD messages however in terms of participants’ efficacy and behavioural intentions goes against a number of
examples investigating the role of self-efficacy for healthy eating outcomes (Anderson, Winett, & Wojcik, 2007; Brug, Lechner, & De Vries, 1995; Steptoe et al., 2003). Furthermore, in the context of this study the significant difference between the high and low threat groups did not carryover and influence higher level EPPM constructs (e.g., danger- and fear-control processes) for eating healthily. Therefore, providing little evidence to support the EPPM for such in health communications about CVD and the associated health behaviours.

4.4.1.4 Physical activity

Within this study, no support was found for an effect of the EPPM-based health messages on participants’ perceived efficacy for physical activity. Participants’ self and response efficacy to physical activity were assessed, and no significant differences were demonstrated between varying the level of CVD threat or physical activity efficacy information. This is in opposition to a couple of examples that have used EPPM-based constructs to develop physical activity guidelines for large campaigns and among different populations (Batchelder & Matusitz, 2014; Hatchell et al., 2013). Within this study, a large proportion of the participants were female even though no focus was placed on recruiting one gender over the other during data collection. In an assessment of tailored communications, Millar and Houska (2007) highlighted the mediating role of masculinity for positive reactions and behavioural intentions for sunscreen use after exposure to an EPPM-based skin cancer messages. The lack of impact within the current study from the efficacy information relating to physical activity is a cause for concern particularly given the high rates of physical inactivity among women in Europe (Nichols et al., 2012; Shimanoe et al., 2014).

A premise of the EPPM is the effect that the perceived threat of the illness and the perceived efficacy of the related health behaviour can potentially have on an
individual’s behaviour or behavioural intentions (Goodall & Roberto, 2008). Although no significant impacts were found on participants’ EPPM computed scores from the CVD messages for physical activity, a significant difference was observed between the high and low efficacy groups for participants’ behavioural intentions to exercise in the next month. Those who received the high efficacy information in terms of physical activity reported higher intentions to exercise than participants who received low efficacy information. Participants’ behavioural intentions to exercise in the next month were assessed through an individual measure included after the EPPM response and self-efficacy measures. Efficacy beliefs, in particular self-efficacy, play a role in improving physical activity levels (Bandura, 1997; Prochaska & DiClemente, 1983) and consistent results support their utility for such (Burke, Beilin, Cutt, Mansour, & Mori, 2008; Dutton et al., 2009; Kaewthummanukul & Brown, 2006; Lewis, Marcus, Pate, & Dunn, 2002; Sharma, Sargent, & Stacy, 2005; Sherwood & Jeffery, 2000).

4.4.1.5 Message derogation

There was little evidence found in the study to support differences between the groups in terms of the four measures of message derogation, and in turn fear control processes. It should be noted that the current study did not include individual measures of fear within the items accessing fear control processes, as a number of fear control responses were already being assessed (e.g., defensive avoidance, perceived manipulation, denial, etc.). Due to the EPPM originating from the fear appeals domain, suggestions have been made in the literature for the inclusion of such (Popova, 2012) and future investigations could benefit from their inclusion.

In terms of general health literacy for CVD, it was noted that the sample reported low rates of personal and family history of CVD. The lack of personal history of CVD is unsurprising given the average age of participants. Efforts were made to
recruit participants from a sample of the general population; however, the average age of the sample was found to be in the mid-20s. The lack of family history is inconsistent with the reported rates of CVD in Ireland and Europe (Eurostat, 2009; Kabir, Bennett, Critchley, & Capewell, 2007; McGee, 2010; Muller-Nordhorn et al., 2008; Muller-Nordhorn et al., 2004; Sans et al., 1997). As such questions could be raised about the awareness and knowledge of CVD among the sample, particularly among a young, Irish sample. Future research may consider examining reasons for such. Consideration should be paid to the potential that the current sample may have been biased (see section 7.3 for further discussion). In an examination of the role of family history, Vornanen et al. (2016) demonstrated the differing influence of such for the risk perception of a number of different diseases including CVD. Additionally, in order to further test the EPPM for use in communicating the risk of CVD, a population that would be at a greater risk of such and experience greater burden from CVD and the associated health behaviours (e.g., men over 55 years and women over 65 years; Gazmararian et al., 2006; Harris et al., 1997; Yazdanyar & Newman, 2009) may present a potential for future investigations.

4.4.2 Practical implications

From a practical perspective, the greatest consideration from this investigation into the EPPM for CVD and the associated health behaviours is the large amount of skewed data that was found for all measures. In general, the majority of participants within this sample reported high levels of perceived threat (across all measures of such), high levels of perceived efficacy (across all health behaviours included and all measures utilised) and then low levels of message derogation, avoidance and denial. Participants seemed accepting of the threat posed by CVD and the information presented about such to them in the study. In general, in accessing participants’
reactions to the CVD information and their assessment of it, participants did not display any marked agreement with the information being exaggerated, trying to manipulate feelings or straining the truth. Furthermore, participants were overall very confident in the effectiveness of the associated health behaviours to prevent CVD and in their ability to carry such behaviours in the following month.

When examining the differences between the associated health behaviours, there did seem to be a greater awareness among participants for the effectiveness of smoking versus the other health behaviours (e.g., eating health, physical activity). As acknowledged in section 4.1, the body of literature assessing health communications, especially fear appeals based communications, in relation to smoking is much greater than that on eating healthily or physical activity (Bassett-Gunter, Martin Ginis, & Latimer-Cheung, 2013; Gharlipour et al., 2015; Hatchell et al., 2013; Leshner et al., 2011; Wright et al., 2006) and smoking behaviours have formed considerable sections of health communications on other diseases, in particular various kinds of cancers (Fishbein & Cappella, 2006; Noar, Benac, & Harris, 2007; Rimer & Glassman, 1999; Witte & Allen, 2000). Given the current increasing rates of obesity across European countries (Kabir, Bennett, Shelley, et al., 2007; Kabir et al., 2013; WHO, 2011; Wild et al., 2004), in the future an emphasis may need to be placed on communicating the links between diet and exercise to health outcomes for diseases such as CVD.

4.4.3 Limitations

The study had a number of limitations that should be noted. Firstly, a large proportion of the sample were students and female, which could raise questions regarding the socioeconomic status of the sample and the generalizability of results. Attempts were made in recruitment to acquire participants that would represent the general population (e.g., university staff members); however, as much of the
recruitment was done in universities, this resulted in a predominantly younger, student sample. Secondly, participants completed the study online. This was to aid in participant recruitment; however, it meant that the environment in which the individual completed their participation could not be controlled.

As mentioned above the EPPM-based CVD messages were varied regarding the level of information in terms of severity and susceptibility of CVD (high versus low), and self and response efficacy for the related health behaviours (high versus low). However, examples in previous research have included more focused manipulations of the risk information, e.g., varying ratios of threat to efficacy information (Carciooppolo et al., 2013) and personalised risk information for different populations (Barnett et al., 2009; Basil, Basil, Deshpande, & Lavack, 2013; Gould et al., 2015; Kotowski, Smith, Johnstone, & Pritt, 2011) that could have been utilised in the current study. Finally, as discussed above the data were heavily skewed and transformations had to be completed to allow parametric analyses to be conducted.

4.4.4 Conclusions and future research

Given the lack of overall effects from the EPPM-based CVD messages and the inconsistent results for threat, the current investigation provides little evidence to support the use of the EPPM for communicating risks of CVD and efficacy information about the associated health behaviours. However, the study suffered from heavily skewed data in terms of both threat and efficacy appraisals, and assessments of the message derogation. In general the sample reported high levels of threat appraisals for CVD and high perceived efficacy for the associated health behaviours. Given such, future investigations will aim to conduct a more focused examination of the levels of threat and efficacy information included in the CVD risk messages in order to elucidate possible differences between variances in the amount of threat and efficacy
information. Following the example of Carcioppolo et al. (2013), the following chapter will present an examination of varying threat-to-efficacy ratios for EPPM-based CVD risk communications. Additionally, given the reported rates of personal and family history of CVD in the current study, future investigations will focus on individuals over the age of 65 years given the higher rates of CVD and the increased burden of such for this population.
Chapter 5: Testing EPPM Propositions among an At-Risk Population, Part One

5.1 Introduction

As outlined in section 4.4.4, the current study examined the EPPM in a more focused experimental manner, taking into consideration the results of study two. A discussion of the relevant literature is included below, along with a consideration of the literature examining dual processing for decision-making and risk among older adults, and rates of CVD among older individuals.

5.1.1 Older populations

5.1.1.1 CVD and associated health behaviours

Even with the global declines in CVD mortality in the last three to four decades (Aspelund et al., 2010; Bennett et al., 2013; Finegold, Asaria, & Francis, 2013; O'Hara et al., 2008; O'Keefe et al., 2013; Young et al., 2010), the rates of CVD among men over the age of 55 years and women over the age of 65 years are still considerably high (Marmot, 2003; Nichols, Townsend, Scarborough, & Rayner, 2013). CVD is the most common cause of death within Europe, accounting for 49% of deaths among women and 41% of deaths among men (Townsend, Nichols, Scarborough, & Rayner, 2015). In recent reports, the perception of CVD as a men’s disease has been acknowledged as incorrect and within certain age groups (before the age of 75 years), CVD is more common among women than men (Nichols et al., 2012). Furthermore, the rate of CVD among older populations is three times higher than that in younger populations (Peterson & Masoudi, 2007) and coupled with the ever growing proportion of older individuals within our population (WHO, 2015), CVD for older individuals is a major concern; to the point where there have been calls within the literature for acknowledgment of a new type of CVD, “cardiovascular aging”, due to the adverse biological effects of aging on the cardiac system (Lakatta, 2015).
Within an Irish context, the relative reductions in age-standardised CVD mortality rates have occurred in individuals below the age of 65 years, but not for older individuals (McGee, 2010). Among older Irish adults, one in five are current smokers (with equivalent rates for both genders), rates of ‘problem drinking’ are high, and two thirds report moderate or high (67%) levels of physical activity (TILDA, 2011). However, physical activity declines considerably with age (Murtagh, Murphy, Murphy, Woods, & Lane, 2014), and Irish adults above the age of 75 years reported the lowest levels of physical activity compared to other individuals over the age of 50 years (TILDA, 2011). Furthermore, older women are 1.5 to 2 times more likely to report inadequate levels of physical activity than men (Department of Health and Social Protection, 2011; TILDA, 2011).

The figures are worrying given the beneficial effects of quitting or refraining from smoking, reducing alcohol intake and partaking in regular physical activity for older adults in terms of reducing CVD risk (Appelman, van Rijn, Ten Haaf, Boersma, & Peters, 2015; Hajduk & Chaudhry, 2016; Hvidtfeldt et al., 2010; Lillo, Palomo-Vélez, Fuentes, & Palomo, 2015; Mons et al., 2015; Mukamal et al., 2006; Wagner, LaCroix, Buchner, & Larson, 1992). Furthermore, elderly individuals with CVD report significantly lower health-related quality of life than other age groups (De Smedt et al., 2013). Given the role of such health behaviours for health outcomes like CVD, factors influencing health decision-making require attention. There is a considerable lack of research examining such within older individuals.

5.1.1.2 Dual processing of judgment, decision-making and risk

There is a large body of research reporting declines in a wide range of cognitive abilities (e.g., sensory functioning, working memory, attention, and executive abilities, information processing) as individuals’ age (Birren & Schaie, 2006; Craik & Salthouse,
2008; Johnson, 1990; Ravdin & Katzen, 2013). However, results are inconsistent and particularly among older ages, chronological age is not as good a predictor of decline as might be expected (Carstensen, 2006). Support for the stability, and even improvement, of emotional regulation into old age is building within the literature (Charles & Carstensen, 2010; Charles, Mather, & Carstensen, 2003; Rahhal, May, & Hasher, 2002; Scheibe & Carstensen, 2010). Early studies suggested a positivity effect among older adults, as they paid greater attention to positive aspects, were more motivated to retain control over their negative emotions and were more effective at doing so compared to younger adults (Blanchard-Fields, Jahnke, & Camp, 1995; Carstensen & Turk-Charles, 1994; Gross et al., 1997; Lawton, Kleban, Rajagopal, & Dean, 1992).

As discussed in the literature review (see section 2.2.2) greater consideration is being paid to the influence of affective processes in attitude-formation, judgment and decision-making (Damasio, 1994; Finucane et al., 2000; Finucane & Holup, 2006; G. Loewenstein & Lerner, 2003; Loewenstein et al., 2001). A number of researchers have begun to examine the effect of aging and possible differences in emotional regulation for judgment and decision-making; however, there are still relatively few investigations when compared with the large bodies of research on other aspects of decision-making (Sanfey & Hastie, 2000; Yates & Patalano, 1999). Finucane (2008) puts forward the argument that because older individuals experience decline in other cognitive abilities, they begin to rely more on affective cues and information in order to guide them in their judgment and decision-making. There is a growing need for a greater understanding of how such can impact relevant decisions for older adults, particularly in terms of their health and quality of life (Peters, Finucane, MacGregor, & Slovic, 2000). In a review of dual information processing for decision-making among older adults, Peters, Diefenbach, Hess, and Västfjäll (2008) highlighted the main considerations for such
(e.g., slowing of information processing abilities, deficits in memory and learning, decline in the ability to prevent external factors influencing the decision, increase in the use of heuristics and bias) and also the sparse investigations considering age differences for dual information processing.

A similar criticism exists for the literature examining risk perceptions in older adults. A common stereotype for older individuals is that they are risk avoidant and cautious when dealing with risks (Heckhausen, Dixon, & Baltes, 1989; Mather et al., 2012; Okun, 1976; Rolison, Hanoch, & Wood, 2012). However, results from recent investigations have shown that this is not always the case and various factors (e.g., initial perception of the risk, explicit versus implicit risks, level of certainty) associated with the risk can result in older individuals taking greater risks or no age differences between young and old populations (Mather, 2006; Mather et al., 2012; Rolison et al., 2012). Unsurprisingly given the lack of research examining affective aspects for decision-making in older adults, there are few guidelines for communicating health risks and decisions to the elderly (Finucane, 2008).

Along with the lack of investigations into CVD among older populations (Jansen et al., 2015; Peterson & Masoudi, 2007), there is a considerable gap in the literature examining the communication of CVD risks and information to elderly individuals. A lack of informed guidelines is a cause for serious concern given the complex health decisions that are commonly faced by older adults (Lockenhoff & Carstensen, 2004; Mather, 2006). More investigations are needed to establish what is the most effective information to include in health risk communications to older adults, as previous research has shown that older adults are less likely to search for information when assessing risks and making health decisions (Gutteling & de Vries, 2016;
Leventhal, Easterling, Leventhal, & Cameron, 1995; Meyer, Russo, & Talbot, 1995; Zwahr, Park, & Shifren, 1999).

5.1.1.3 EPPM

As previously mentioned (see section 4.1) when considering health communications and campaigns there are considerable differences between populations in terms of the most salient constructs for each and their reactions to the health information (Dutta-Bergman, 2005; Van’t Riet & Ruiter, 2013). When assessing the body of research on fear appeals, much of the investigations to date have been completed on students, limiting the ability to draw conclusions for other populations (Hastings et al., 2004). Furthermore, similar to the points outlined above, adults can have different reactions to emotional, threat and risk content within health communications when compared to their younger counterparts (Backer, Rogers, & Sopory, 1992; Hale & Dillard, 1995). Considering the EPPM in terms of older individuals, the theory has been used to examine communicating information about CVD, cancer and influenza vaccination (Leung, Wong, & Chan, 2016; McKay et al., 2004; Prati, Pietrantoni, & Zani, 2012).

For CVD, as discussed previously (see section 4.1), McKay et al. (2004) provided limited support for the EPPM for communicating about CVD associated behaviours. Additionally, Davis et al. (2009) found no age differences between a young and old sample following exposure to EPPM-based stroke posters. Limitations for both studies raise questions about the generalisability of results. Two studies have also utilised constructs from the EPPM to assess factors affecting cancer-screening behaviours and reactions to cancer risk information (Leung et al., 2016; Miles, Voorwinden, Chapman, & Wardle, 2008). Among a sample of nearly 250 older (60+ years) Chinese community-dwelling adults, the EPPM along with the HBM (Janz &
Becker, 1984), was recently utilised to examine which psychosocial barriers and facilitators were associated with the likelihood of having completed a colorectal cancer screening in the past (Leung et al., 2016). From the EPPM, it was found that perceived severity was significantly associated with colorectal cancer screening. However when compared to the significant associations from the HBM (in particular, knowledge barriers), the effect of perceived severity was much smaller and in the opposite direction to what would be predicted from the EPPM (Witte, 1992; Witte et al., 2001) such that, participants with higher levels of perceived severity avoided taking part in the health behaviour (Leung et al., 2016).

It is unclear from the study about the role of self and response efficacy as no significant results were found for self-efficacy and no measure of response efficacy from the EPPM was included. Furthermore, it should be noted that the authors chose to include self-efficacy as part of the HBM and not the EPPM. It is difficult to make any confident prediction in relation to the EPPM in terms of the avoidant behaviour of those older Chinese adults who perceived high levels of severity for colorectal cancer when no EPPM-based measures of self and response efficacy were included. Previously, Miles et al. (2008) in their assessment of EPPM based predictors of cancer information avoidance among older adults (50 to 70 years) found that perceived severity mediated the relationship between the positive relationship between high levels of cancer fear and high levels of cancer information avoidance. However, the study was cross-sectional and as thus, no causal implications can be suggested from the correlational assessment of psychological factors impacting on cancer information avoidance.

When considering protective behaviours for older adults, influenza vaccination has received a large amount of attention within the literature due to the serious consequences of influenza among older adults (Muller, Nguyen-Van-Tam, & Szucs,
Prati et al. (2012) utilised two messages about influenza vaccination, both based on the EPPM, in order to assess if didactic or narrative formats of communications were more effective. In an Italian sample of older (65+ years) adults, no significant differences between the two message groups in their perceived risk, perceived efficacy and intentions to get the flu shot were found. However, the didactic group did report higher risk perception compared to the control group and the narrative based group did report higher risk perception and higher efficacy compared to the control group (Prati et al., 2012). Effect sizes for such were small, and given the lack of differences between the two message formats, the overall evidence for or against narrative versus didactic formats is weak. However, the higher reports of risk perception and efficacy among those who did receive an EPPM based message versus those who did not, do support its use for communicating information about influenza vaccination.

Given the high rates of racial disparities in the uptake of influenza vaccination, Cameron et al. (2009) sought to provide greater information about the key issues for communicating to African American seniors (65+ years) about getting an influenza vaccination. Focus groups revealed that levels of knowledge about influenza and the vaccinations, as well as the individual’s health status, affected their perceived susceptibility for getting the flu. In particular they highlighted the need for greater examination of influencing factors among marginalised groups that are at a greater risk from the health threat (Cameron et al., 2009). For efficacy, accessibility and the cost of the vaccine were found to impact on self-efficacy, while side effects (e.g., vaccine caused influenza) were noted of particular importance for response efficacy. In particular, the study found that antecedents to vaccination had a large role to play in participants’ self-efficacy. The article is a good example of a focused investigation into
the relevant variables affecting the effectiveness of EPPM based communications for that specific cohort, and provides a large amount of information for future tailored and targeted messages that have been shown to be effective in health promotion efforts (Kreuter, Oswald, Bull, & Clark, 2000; Kreuter, Strecher, & Glassman, 1999; Kreuter & Wray, 2003). To date very few studies have examined the EPPM exclusively and in an experimental based design for communicating information about CVD risks and associated health behaviours to older adults.

5.1.2 Testing EPPM propositions

As discussed throughout section 4.1, there are a number of gaps existing in the literature on the EPPM (Maloney et al., 2011; Ooms et al., 2015; Popova, 2012). Furthermore, in a recent meta-analysis of the effectiveness of fear appeal communications, Peters and colleagues (2013) attributed the inconsistencies found among results to flawed methodology. A number of studies utilising the EPPM are deemed to be inappropriate as they lack a true control (Stephenson & Witte, 1998). However, there is little information among the EPPM literature for what constitutes a “true” control. The model states that the individual must perceive some level of threat in order to engage with the information (Witte, 1992; Witte et al., 2001). Therefore, presenting participants with no information at all would not evoke the necessary levels of threat required in line with the model for effective health communications. Carcioppolo and colleagues (2013) highlighted that there is a considerable lack of investigations and information on the EPPM assessing the optimal levels of threat and efficacy components for health communications. One of the main premises of the model is that the health communication must contain components of both threat and efficacy in order to be considered an effective communication. An effective
communication in terms of the EPPM is one that results in danger-control processes (Perloff, 2003; Witte et al., 2001).

Messages that do not contain the correct amount of threat and efficacy information can result in fear-control processes such as denial, message derogation and maladaptive coping (Witte, 1992; Witte, 2009; Witte & Allen, 2000), which when examining health risks and decision-making could have severe consequences for the individual. Carcioppolo et al. (2013) manipulated the ratios of threat-to-efficacy information for communicating two types of HPV vaccination (one in terms of cervical cancer and the second in terms of genital warts). Participants for the study were undergraduate females from a large Mid-western university in the United States given the high relevance of such information for that particular population (e.g., the US government recommends the HPV vaccines for young women under the age of 27 years; Patel et al., 2012). The authors developed six EPPM threat-to-efficacy ratio messages per diseases (12 in total) dependent on whether the messages contained zero, one or two elements of threat and efficacy information, about the HPV vaccine and cervical cancer or genital warts (Carcioppolo et al., 2013).

Through mediation analysis, it was found that there were no significant differences between the ratio conditions and the standard condition that contained the basic 1/1 threat-to-efficacy ratio; however, when taking possible mediators into account, it was found that the standard (1/1 ratio) message was most effective. This was due to the low threat (0/1) condition reporting significantly lower vaccine intentions, which was associated with participants’ fear responses. This result is in line with what would be expected according to the EPPM for participants who had not received any threat information (Witte, 1992; Witte et al., 2001). Also, those in the low efficacy (1/0), low threat (0/1) and high efficacy (1/2) conditions reported significantly lower
intentions than the standard group which was partially explained by their perceived susceptibility (Carcioppolo et al., 2013).

At a similar time, Krieger and Sarge (2013) also examined communications about the HPV vaccine in order to test the independence and possible relationships between the four main constructs of the EPPM: severity, susceptibility, self-efficacy and response efficacy. When assessing an individual’s perceived treat and efficacy, Witte and colleagues (1992; 2001) posited an additive relationship where severity and susceptibility are combined for the total threat perception, and similarly self and response efficacy are combined for the total perceived efficacy. Due to a lack of empirical support for the ‘critical point’ between threat and efficacy perceptions (see section 4.1) and inconsistent findings of threat and efficacy as mediators (Gore & Bracken, 2005; Ooms et al., 2015; Popova, 2012), Krieger and Sarge (2013) completed mediation analyses to examine the independent role of the four constructs on HPV vaccine intentions among undergraduate female students and their mothers.

The authors found that increased self-efficacy (e.g., talking to a doctor), through increased response efficacy (increasing response efficacy of this behaviour), had a greater effect on increasing behavioural intentions for getting the HPV vaccine, than severity and susceptibility perceptions. The results were only found among the undergraduate female students, and not for their mothers (Krieger & Sarge, 2013). The study highlights the importance of the efficacy components, and the relationship between self and response efficacy for impacting health behavioural intentions. The study varied the message frame in relation to genital warts or cervical cancer; however, no adjustments were made to the level of threat or efficacy information included in the messages presented to mothers or daughters. To date, the study by Carcioppolo and colleagues (2013) is the only study to manipulate levels of both threat and efficacy
information in an assessment of the optimal amount of information that needs to be included in EPPM-based health communications.

5.1.3 Objectives and hypotheses

Due to the results of study two, the objective of study three (part one) was to test EPPM-based threat-to-efficacy ratios in health risk messages about CVD and the associated health behaviours among older adults (60+ years) who would be at an alleviated risk of CVD. The study utilised a mixed method approach. The current chapter focuses on the quantitative approach; see chapter six for the qualitative aspect. A between-groups design was utilised and the study sought to replicate and build upon the findings of Carcioppolo et al. (2013). Similar to Carcioppolo et al. (2013), the overall aim of the study was to conduct an experimental test of six threat-to-efficacy ratios based on the EPPM for CVD and the associated health behaviours among older adults (60+ years) given the considerable lack of previous investigations into such. Participants were randomly assigned to one of six EPPM threat-to-efficacy CVD message groups: 1) “standard” message with 1/1 threat-to-efficacy ratio, 2) “low efficacy” message with 1/0 threat-to-efficacy ratio, 3) “low threat” message with 0/1 threat-to-efficacy ratio, 4) “high efficacy” message with 1/2 threat-to-efficacy ratio; 5) “high threat” message with 2/1 threat-to-efficacy ratio; and 6) “overload” message with 2/2 threat-to-efficacy ratio.

Based on EPPM constructs and previous research, the following hypotheses were tested:

Hypothesis 1: Participants in the “standard” (group one) and “overload” (group six) message groups will be more likely to partake in danger-control processes (Hypothesis 1a), in particular when compared to the “low efficacy” (group two) and “high threat” (group five) message groups. This is due to participants within groups one
and six receiving equal components of threat and efficacy information, whereas those in groups two and five will receive more threat than efficacy information. Following such and given the results of Carcioppolo and colleagues (2013), the “standard” group (group one) potentially will report partaking in more danger-control processes than the “overload” group (group 6), given that the “overload” group receive two components of threat and efficacy information (Hypothesis 1b).

Hypothesis 2: Participants in the “low efficacy” (group two) and “high threat” (group five) message groups will be more likely to partake in fear-control processes, when compared to those in the “low threat” (group three) and “high efficacy” (group four) message groups (Hypothesis 2a). This is due to the former (groups two and five) receiving more components of threat than efficacy information. Similarly, those in the “low threat” (group three) and “high efficacy” (group four) message groups will be more likely to report partaking in danger-control processes, compared to the “low efficacy” (group two) and “high threat” (group five) message groups, given that the former receives more efficacy information in their messages (Hypothesis 2b).

Hypothesis 3: The extent to which the effectiveness of the EPPM threat-to-efficacy ratio messages for CVD associated health behavioural intentions, will be affected by threat and efficacy appraisals, was tested using the four following specific hypotheses, with predictions made in line with EPPM constructs:

3a: Participants’ threat appraisals for CVD will impact the relationship between the message groups and behavioural intentions for eating healthily, such that those who receive more threat components (groups two and five) within their messages, will be more likely to report lower behavioural intentions for eating healthily, than the other four groups (one, three, four, and six).
3b: Participants’ efficacy appraisals for eating healthily will impact the relationship between the message groups and behavioural intentions for eating healthily, such that those who receive more efficacy components (groups three and four) within their messages, will report higher behavioural intentions for eating healthily, than the other four groups (one, two, five and six).

3c: Participants’ threat appraisals for CVD will impact the relationship between the message groups and behavioural intentions for physical activity, such that those who receive more threat components (groups two and five) within their messages, will be more likely to report lower behavioural intentions for physical activity, than the other four groups (one, three, four, and six).

3d: Participants’ efficacy appraisals for physical activity will impact the relationship between the message groups and behavioural intentions for physical activity, such that those who receive more efficacy components (groups three and four) within their messages, will report higher behavioural intentions for physical activity, than the other four groups (one, two, five and six).

Hypothesis 4: Similar to study two and as outlined in section 4.1.3.1, participants will report higher levels of comparative susceptibility and severity for CVD, compared to personal susceptibility and severity for CVD.

5.2 Method

5.2.1 Design

Study three tested EPPM-based threat-to-efficacy ratios in health risk messages about CVD and the associated health behaviours among older adults (60+ years) who would be at an alleviated risk of CVD. The study sought to address the hypotheses as outlined in section 5.1.3. The study was approved by the ethics committee in the School of Psychology, TCD (see Appendix A). For part one, a between-subjects design was
employed with participants randomly assigned to one of six groups depending on the EPPM-based threat-to-efficacy ratio they received within the CVD risk message: 1) “standard” message with 1/1 threat-to-efficacy ratio \( (n = 44) \), 2) “low efficacy” message with 1/0 threat-to-efficacy ratio \( (n = 35) \), 3) “low threat” message with 0/1 threat-to-efficacy ratio \( (n = 44) \), 4) “high efficacy” message with 1/2 threat-to-efficacy ratio \( (n = 38) \); 5) “high threat” message with 2/1 threat-to-efficacy ratio \( (n = 35) \); and 6) “overload” message with 2/2 threat-to-efficacy ratio \( (n = 46, \text{ see Appendix S}) \). The study was completed online through surveygizmo.com and through in-person interviews.

5.2.2 Participants

5.2.2.1 Eligibility criteria

Three eligibility criteria were set for the study: participants had to be 60 years of age or older, capable of giving consent to participate and have a good standard of English.

5.2.2.2 Recruitment

Recruitment and testing took place between February and August 2016. A large number of ageing and volunteer organisations, active retirement groups, Men’s Shed groups, GP offices and church parishes were contacted. The ageing, volunteer, active retirement and Men’s Sheds groups were asked to share a short description of the study (based on the study poster) with their members either in person or through social media platforms (e.g., Facebook, Twitter, etc.). GP offices within Dublin city and the surrounding areas were asked to display the study poster on their noticeboards. Church parishes within the Archdioceses of Dublin (city and county), and Cashel and Emly were asked to display the study poster on their noticeboard or include the study information in their parish newsletters (see Appendix T). A notice containing the study
information was also included in the online forum for the distance-learning centre in Dublin City University (DCU).

After receiving the study information and invitation to participate, participants were asked to either contact the main researcher to arrange a testing session or click on the link included in the study poster if they were happy to participate. Participants were also invited to contact the researcher if they had any questions relating to participation before clicking on the survey link. Those participants who did contact the main researcher directly were informed that they could complete the study online or in person. G*Power (Faul et al., 2007) analysis revealed that for ANOVA with a statistical power of 0.80 to detect a medium effect size (0.25), as being significant at an alpha level of 0.05, suggested a sample of 211 participants would be need to be recruited (approx. 35 participants per group).

5.2.3 Materials

The EPPM-based threat-to-efficacy ratio messages were compiled using the same CVD risk and efficacy information that was employed for studies one and two (see section 4.2.3). The amount and format of the information was changed so that the six varying ratios of threat and efficacy information could be achieved, with messages containing either zero, one or two components of threat and efficacy information. The structure for the messages was based on that of Carcioppolo et al. (2013) as discussed in section 5.1. Based on the EPPM, six different versions of the CVD risk information were created: 1) “standard” message with 1/1 threat-to-efficacy ratio, 2) “low efficacy” message with 1/0 threat-to-efficacy ratio, 3) “low threat” message with 0/1 threat-to-efficacy ratio, 4) “high efficacy” message with 1/2 threat-to-efficacy ratio; 5) “high threat” message with 2/1 threat-to-efficacy ratio; and 6) “overload” message with 2/2
threat-to-efficacy ratio (see Appendix S). The ratios are indicative of the number of threat and/or efficacy bullet points that were included in each message.

5.2.4 Measures

5.2.4.1 Demographic characteristics, medical history and health behaviours

See section 3.3.4 for description of measures assessing demographic characteristics, medical history and health behaviours.

5.2.4.2 Risk Behaviour Diagnosis Scale

The same EPPM-based measures as utilised in study two were employed to assess perceived threat, perceived efficacy in relation to the associated health behaviours and reactions to the CVD risk message (see section 4.2.4.4). Three additional questions were included among the measures assessing the reactions to the CVD risk message. Participants were asked to indicate how much the CVD message had made them feel frightened, nervous and anxious using a seven-point Likert scale (see Appendix U). Scores can range from one to seven, with higher scores indicating higher levels of fear, nervousness and anxiousness.

5.2.5 Procedure

The same procedure for participants taking part online and in-person was followed. Participants were first asked to read the information sheet (as for study two), then they were informed of the nature of the study and reminded that they could withdraw from the study at any stage if they so wished. After reading the information sheet, participants were asked to complete the consent form (as for study two), if they were happy to proceed with participation. Participants were presented with four consent questions to complete, and answering no to any of the four questions brought participants immediately to the debriefing sheet or termination of the in-person testing session. Following this if full consent had been given, participants were asked to
complete the demographics and health questionnaire. It was stated in the information sheet to participants that the questionnaire contained questions relating to their health, and if they wished not to answer such questions, they were not obliged to. Additionally, on the online survey, the ‘Require Answer’ option was not used. If a response had been left blank, participants were notified of such however they were informed that if they had intended to leave the response blank then to please continue on with participation.

After completion of the demographics and health questionnaire, participants were randomly allocated to receive one of the six EPPM-based CVD risk scenarios. Participants were asked to read and consider the CVD risk information. After reading the CVD risk information, participants were asked to complete the RBD scale. Due to the number of measures within the questionnaire, it was split across five pages; 1) questions relating the CVD threat appraisals; 2) questions relating to smoking; 3) questions relating to eating healthily; 4) questions relating to physical activity; and 5) questions relating to the health information.

Once participants had worked their way through the RBD scale, they were debriefed (as for study two), thanked for their participation, and given the contact details of the researcher should they have any questions about the study at a later date.

5.2.6 Analysis

Data were analysed with IBM SPSS Statistics (v. 23). Participants were not required to answer all questions due to the sensitive nature of a number of the questionnaires included in the study (e.g., personal and family history of CVD, depression, etc.), leading to a certain amount of missing data. However, the attrition rates for the study were low (approximately 23% for most analyses). For instances where only one item was missing from the RBD questionnaire, it was replaced with the mean of the existing similar items. This was completed for 11 participants. Perceived
threat, perceived efficacy and the discriminating variables were all calculated in the same way as they had been for study two: perceived threat was a combination of the individual’s perceptions of personal risk, personal susceptibility, harm of CVD and severity of CVD; and perceived efficacy was a combination of two response efficacy items and two self-efficacy items (see section 4.2.6 for details).

When assessing the data, it was noted that a number of variables were non-normally distributed. For such items, medians and interquartile ranges (IQRs) are presented for descriptive statistics and transformations were completed on the data for the final analyses. Reflect and \( \log_{10} \) transformations were completed where necessary for the CVD threat and health behaviour efficacy measures, as the data for such were negatively skewed. However, for the health information measures, \( \log_{10} \) transformations were completed as the data were positively skewed. In any analysis that was completed on a transformed variable, descriptive statistics for significant results and trends are presented using the back-transformed means and 95% confidence intervals (Jorgensen & Pedersen, 1997).

Chi-square analyses were conducted to establish any associations between EPPM message groups and danger and fear-control processes. One-way between-groups ANOVAs were conducted to evaluate the effects of the six EPPM threat-to-efficacy ratio messages on CVD threat, smoking efficacy and behavioural intention measures, and the message derogation measures. Multiple regression modelling with moderation was completed to access the impact of threat and efficacy appraisals on the relationship between the message groups and behavioural intentions for eating healthily and physical activity (see section 5.3.3.3 and 5.3.3.4 for further details). As the outcome variables within the regression models were behavioural intentions, it was not possible to complete such analysis for smoking behavioural intentions. For smoking behavioural
intentions, only the data from current and ex-smokers was accessed and the sample size did not allow adequate power for multiple regression analysis.

In order to carry out the moderation analyses, the Hayes (2016; Hayes & Matthes, 2009) PROCESS macro (v. 2.16) for SPSS was used. Lastly, to examine the differences between perceived personal and social comparison risk and severity of CVD, t-tests were conducted. All analyses were two-tailed. The alpha level for significance was set at the standard .05 except where corrections were made for multiple comparisons. Where corrections were made for multiple comparisons the procedure and new alpha level is identified for the relevant analysis. Any results falling within the range of .05 to .10 were considered as trends.

5.3 Results

5.3.1 Sample characteristics

Of all the participants invited to take part in the study, 267 gave consent and began participation. Nine participants who were under the age of 60 years or who didn’t provide information pertaining to their age were removed. Furthermore, six participants who completed the demographics and health questionnaire but exited the study before receiving a CVD risk message were removed. See section 5.2.6 for how missing data was dealt with. Participants were randomly assigned to receive one of six CVD risk messages based on the EPPM: 1) “standard” message (1/1 ratio; \( n = 44 \)), 2) “low efficacy” message (1/0 ratio; \( n = 35 \)), 3) “low threat” message (0/1 ratio; \( n = 44 \)), 4) “high efficacy” message (1/2 ratio; \( n = 38 \)); 5) “high threat” message (2/1 ratio; \( n = 35 \)); and 6) “overload” message (2/2 ratio; \( n = 46 \)). Demographic characteristics for the sample are summarised in Table 5.1, with data split across the six groups.
Table 5.1. Demographic characteristics for sample

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Standard ((n = 40))</th>
<th>Low Efficacy ((n = 33))</th>
<th>Low Threat ((n = 44))</th>
<th>High Efficacy ((n = 38))</th>
<th>High Threat ((n = 35))</th>
<th>Overload ((n = 45))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
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<td></td>
<td>69.36 (7.56;</td>
<td>69.54 (5.84;</td>
<td>69.57 (8.12;</td>
<td>67.24 (5.55;</td>
<td>68.77 (7.86;</td>
<td>65.59 (3.86;</td>
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<td></td>
<td>67.10, 71.63)</td>
<td>67.54, 71.55)</td>
<td>67.10, 72.04)</td>
<td>65.41, 69.06)</td>
<td>66.07, 71.47)</td>
<td>64.44, 66.73)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21 (47.7%)</td>
<td>16 (45.7%)</td>
<td>9 (20.5%)</td>
<td>14 (36.8%)</td>
<td>14 (40%)</td>
<td>18 (39.1%)</td>
</tr>
<tr>
<td>Female</td>
<td>23 (52.3%)</td>
<td>18 (51.4%)</td>
<td>34 (77.3%)</td>
<td>24 (63.2%)</td>
<td>21 (60%)</td>
<td>28 (60.9%)</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irish</td>
<td>40 (90.9%)</td>
<td>32 (91.4%)</td>
<td>41 (93.2%)</td>
<td>34 (89.5%)</td>
<td>33 (94.3%)</td>
<td>40 (87%)</td>
</tr>
<tr>
<td>Non-Irish</td>
<td>3 (6.8%)</td>
<td>1 (2.9%)</td>
<td>3 (6.8%)</td>
<td>2 (5.3%)</td>
<td>2 (5.7%)</td>
<td>6 (13%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>5 (11.4%)</td>
<td>2 (5.7%)</td>
<td>3 (6.8%)</td>
<td>4 (10.5%)</td>
<td>4 (11.4%)</td>
<td>7 (15.2%)</td>
</tr>
<tr>
<td>Married</td>
<td>29 (65.9%)</td>
<td>22 (62.9%)</td>
<td>30 (68.2%)</td>
<td>26 (68.4%)</td>
<td>15 (42.9%)</td>
<td>30 (65.2%)</td>
</tr>
<tr>
<td>Living with partner as if married</td>
<td>1 (2.3%)</td>
<td>-</td>
<td>-</td>
<td>1 (2.6%)</td>
<td>1 (2.9%)</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>2 (4.5%)</td>
<td>1 (2.9%)</td>
<td>-</td>
<td>1 (2.6%)</td>
<td>6 (17.1%)</td>
<td>3 (6.5%)</td>
</tr>
<tr>
<td>Separated</td>
<td>2 (4.5%)</td>
<td>3 (8.6%)</td>
<td>3 (6.8%)</td>
<td>2 (5.3%)</td>
<td>2 (5.7%)</td>
<td>1 (2.2%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>5 (11.4%)</td>
<td>7 (20%)</td>
<td>8 (18.2%)</td>
<td>4 (10.5%)</td>
<td>7 (20%)</td>
<td>3 (6.5%)</td>
</tr>
<tr>
<td><strong>Education Completed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary level</td>
<td>2 (4.5%)</td>
<td>-</td>
<td>4 (9.1%)</td>
<td>1 (2.6%)</td>
<td>1 (2.9%)</td>
<td>5 (10.9%)</td>
</tr>
<tr>
<td>Secondary level</td>
<td>8 (18.2%)</td>
<td>13 (37.1%)</td>
<td>15 (34.1%)</td>
<td>16 (42.1%)</td>
<td>13 (37.1%)</td>
<td>21 (54.7%)</td>
</tr>
<tr>
<td>Third level</td>
<td>34 (77.3%)</td>
<td>22 (62.9%)</td>
<td>25 (56.8%)</td>
<td>21 (55.3%)</td>
<td>21 (60%)</td>
<td>20 (43.5%)</td>
</tr>
<tr>
<td><strong>Employed Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>1 (2.3%)</td>
<td>-</td>
<td>1 (2.3%)</td>
<td>-</td>
<td>-</td>
<td>1 (2.2%)</td>
</tr>
<tr>
<td>Full-time employed</td>
<td>2 (4.5%)</td>
<td>4 (11.4%)</td>
<td>-</td>
<td>3 (7.9%)</td>
<td>3 (8.6%)</td>
<td>6 (13%)</td>
</tr>
<tr>
<td>Part-time employed</td>
<td>7 (15.9%)</td>
<td>1 (2.9%)</td>
<td>3 (6.8%)</td>
<td>4 (10.5%)</td>
<td>5 (14.3%)</td>
<td>4 (8.7%)</td>
</tr>
<tr>
<td>Stay-at-home parent</td>
<td>-</td>
<td>1 (2.9%)</td>
<td>1 (2.3%)</td>
<td>1 (2.6%)</td>
<td>-</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4 (8.7%)</td>
</tr>
<tr>
<td>Retired</td>
<td>31 (70.5%)</td>
<td>29 (82.9%)</td>
<td>35 (79.5%)</td>
<td>29 (76.3%)</td>
<td>27 (77.1%)</td>
<td>28 (60.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (4.5%)</td>
<td>-</td>
<td>4 (9.1%)</td>
<td>1 (2.6%)</td>
<td>-</td>
<td>1 (2.2%)</td>
</tr>
</tbody>
</table>

*Note.* Missing data is not represented; therefore figures do not equate to the total sample number or 100%.
Within the whole sample there were 92 (38%) males and 148 (61.2%) females (missing = 2, 0.8%) and the mean age was 68.29 years (SD = 6.71; 95% CI = 67.44, 69.44). For nationality, 220 (90.9%) participants identified themselves as Irish, while 17 (7%) participants were non-Irish (missing = 5, 2.1%). For marital status, the majority of participants were married ($n = 152$, 62.8%), widowed ($n = 3$, 14%) or single ($n = 25$, 10.3%). A large number of participants had completed to secondary level ($n = 86$, 35.5%) or third level ($n = 143$, 59.1%) education, while 13 (5.4%) participants had completed to primary level. For employment status, the majority of participants were retired ($n = 179$, 74%). Following such, 18 (7.4%) participants stated that they were working full-time, 24 (9.9%) were working part-time, five (2.1%) were a stay-at-home parent, four (1.7%) were unemployed, and eight participants identified as other (e.g., self-employed, volunteering, etc.; 3.3%; missing = 1, 0.4%).

Self-reported medical history and health behaviour information for the sample are summarised in Tables 5.2, and 5.3, with data split across the six groups. When examining the samples’ reported medical history, a number of inconsistencies were noted in participants’ self-reported personal history of CVD and other on-going health problems. In the total sample, 184 participants when asked if they had a personal history of CVD reported no. However, when asked if they had any other on-going health issues, 34 (18.48%) participants reported yes and when asked for further information, reported a symptom or risk factor for CVD (e.g., high/low blood pressure, high cholesterol, atrial fibrillation, stent, etc.). See section 5.5.5.3 for a discussion of such in relation to the data collected in-person. Additionally, participants reported high rates of no previous history of depression and/or anxiety (62.9% - 81.8% across the six message groups).
Table 5.2

Self-reported medical history for sample

<table>
<thead>
<tr>
<th>Medical History</th>
<th>Standard (n = 40)</th>
<th>Low Efficacy (n = 33)</th>
<th>Low Threat (n = 44)</th>
<th>High Efficacy (n = 38)</th>
<th>High Threat (n = 35)</th>
<th>Overload (n = 45)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>CVD: Personal History</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14 (31.8%)</td>
<td>13 (37.1%)</td>
<td>5 (11.4%)</td>
<td>8 (21.1%)</td>
<td>9 (25.7%)</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>No</td>
<td>26 (59.1%)</td>
<td>20 (57.1%)</td>
<td>39 (88.6%)</td>
<td>30 (78.9%)</td>
<td>26 (74.3%)</td>
<td>43 (93.5%)</td>
</tr>
<tr>
<td><strong>CVD: Family History</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>26 (59.1%)</td>
<td>18 (51.4%)</td>
<td>21 (47.7%)</td>
<td>14 (36.8%)</td>
<td>13 (37.1%)</td>
<td>14 (30.4%)</td>
</tr>
<tr>
<td>No</td>
<td>17 (38.6%)</td>
<td>15 (42.9%)</td>
<td>23 (52.3%)</td>
<td>22 (57.9%)</td>
<td>22 (62.9%)</td>
<td>31 (67.4%)</td>
</tr>
<tr>
<td><strong>On-going Health Issues</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18 (40.9%)</td>
<td>20 (57.1%)</td>
<td>30 (68.2%)</td>
<td>13 (34.2%)</td>
<td>17 (48.6%)</td>
<td>25 (54.3%)</td>
</tr>
<tr>
<td>No</td>
<td>20 (45.5%)</td>
<td>13 (37.1%)</td>
<td>13 (29.5%)</td>
<td>24 (63.2%)</td>
<td>16 (45.7%)</td>
<td>18 (39.1%)</td>
</tr>
<tr>
<td><strong>Depression/Anxiety(^a)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6 (13.6%)</td>
<td>6 (17.1%)</td>
<td>7 (15.9%)</td>
<td>6 (15.8%)</td>
<td>13 (37.1%)</td>
<td>9 (19.6%)</td>
</tr>
<tr>
<td>No</td>
<td>37 (84.1%)</td>
<td>28 (80.0%)</td>
<td>36 (81.8%)</td>
<td>30 (78.9%)</td>
<td>22 (62.9%)</td>
<td>37 (80.4%)</td>
</tr>
<tr>
<td>Do not want to answer</td>
<td>1 (2.3%)</td>
<td>-</td>
<td>1 (2.3%)</td>
<td>1 (2.6%)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\) For full item descriptions and the suggested amounts of exercise and alcohol consumption see Appendix H.

*Note. Missing data is not represented; therefore figures do not equate to the total sample number or 100%.*
Table 5.3

Health behaviour information for sample

<table>
<thead>
<tr>
<th>Health Behaviour</th>
<th>Standard (n = 44)</th>
<th>Low Efficacy (n = 35)</th>
<th>Low Threat (n = 44)</th>
<th>High Efficacy (n = 37)</th>
<th>High Threat (n = 35)</th>
<th>Overload (n = 46)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Eating Habits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t pay attention</td>
<td>3 (6.8%)</td>
<td>2 (5.7%)</td>
<td>3 (6.8%)</td>
<td>6 (15.8%)</td>
<td>4 (11.4%)</td>
<td>3 (6.5%)</td>
</tr>
<tr>
<td>Healthy diet…feel guilty</td>
<td>1 (2.3%)</td>
<td>7 (20%)</td>
<td>9 (20.5%)</td>
<td>1 (2.6%)</td>
<td>2 (5.7%)</td>
<td>8 (17.4%)</td>
</tr>
<tr>
<td>Usually watch what I eat</td>
<td>25 (56.8%)</td>
<td>18 (51.4%)</td>
<td>24 (54.5%)</td>
<td>28 (73.7%)</td>
<td>21 (60%)</td>
<td>27 (58.7%)</td>
</tr>
<tr>
<td>Always watch what I eat</td>
<td>15 (34.1%)</td>
<td>8 (22.9%)</td>
<td>8 (18.2%)</td>
<td>2 (5.3%)</td>
<td>8 (22.9%)</td>
<td>8 (17.4%)</td>
</tr>
<tr>
<td><strong>Exercise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For the suggested amount</td>
<td>19 (43.2%)</td>
<td>5 (14.3%)</td>
<td>12 (27.3%)</td>
<td>11 (28.9%)</td>
<td>10 (28.6%)</td>
<td>20 (43.5%)</td>
</tr>
<tr>
<td>Less than the suggested…</td>
<td>8 (18.2%)</td>
<td>8 (22.9%)</td>
<td>16 (36.4%)</td>
<td>13 (34.2%)</td>
<td>11 (31.4%)</td>
<td>11 (23.9%)</td>
</tr>
<tr>
<td>More than the suggested…</td>
<td>16 (36.4%)</td>
<td>17 (48.6%)</td>
<td>13 (29.5%)</td>
<td>11 (28.9%)</td>
<td>12 (34.3%)</td>
<td>10 (21.7%)</td>
</tr>
<tr>
<td>Do not exercise</td>
<td>1 (2.3%)</td>
<td>5 (14.3%)</td>
<td>3 (6.8%)</td>
<td>2 (5.3%)</td>
<td>2 (5.7%)</td>
<td>5 (10.9%)</td>
</tr>
<tr>
<td><strong>Alcohol consumption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drink the suggested…</td>
<td>9 (20.5%)</td>
<td>5 (14.3%)</td>
<td>7 (15.9%)</td>
<td>7 (18.4%)</td>
<td>6 (17.7%)</td>
<td>6 (13%)</td>
</tr>
<tr>
<td>Less than the suggested…</td>
<td>15 (34.1%)</td>
<td>19 (54.3%)</td>
<td>21 (47.7%)</td>
<td>17 (44.7%)</td>
<td>17 (48.6%)</td>
<td>22 (47.8%)</td>
</tr>
<tr>
<td>More than the suggested…</td>
<td>7 (15.9%)</td>
<td>3 (8.6%)</td>
<td>5 (11.4%)</td>
<td>6 (15.8%)</td>
<td>2 (5.7%)</td>
<td>8 (17.4%)</td>
</tr>
<tr>
<td>Do not drink alcohol</td>
<td>13 (29.5%)</td>
<td>8 (22.9%)</td>
<td>11 (25%)</td>
<td>7 (18.4%)</td>
<td>10 (28.6%)</td>
<td>10 (21.7%)</td>
</tr>
<tr>
<td><strong>Smoking Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>1 (2.3%)</td>
<td>1 (2.9%)</td>
<td>-</td>
<td>1 (2.6%)</td>
<td>5 (14.3%)</td>
<td>2 (4.3%)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>22 (50%)</td>
<td>21 (60%)</td>
<td>14 (31.8%)</td>
<td>19 (50%)</td>
<td>17 (48.6%)</td>
<td>18 (39.1%)</td>
</tr>
<tr>
<td>Never smoked</td>
<td>21 (47.7%)</td>
<td>13 (37.1%)</td>
<td>30 (68.2%)</td>
<td>17 (44.7%)</td>
<td>13 (37.1%)</td>
<td>26 (56.5%)</td>
</tr>
</tbody>
</table>

*For full item descriptions and the suggested amounts of exercise and alcohol consumption see Appendix H.*

*Note.* Missing data is not represented; therefore figures do not equate to the total sample number or 100%.
In reviewing participants’ reported activities for the associated health behaviours, over half of each group and above reported that in terms of their diet they usually watched what they ate but sometimes liked to treat themselves (51.4% - 73.7% across the six groups). For exercise, the rates of no exercise among the older participants were low (2.3% - 14.4%). Similar to previous samples included in this thesis, it was not possible to distinguish any patterns among the different rates of exercise completed by participants. Among the older participants, it was noted that the rates of those who did not drink any alcohol were higher than previous samples (18.4% - 29.5%). After that, the majority of participants reported that they drank less than the suggested amount (see Appendix H; 34.1% - 54.3%). The vast majority of participants were ex-smokers or had never smoked; reported rates of current smokers were low (0 - 14.3%).

5.3.2 Descriptive statistics

5.3.2.1 RBD scale: Threat, efficacy and message derogation

Descriptive statistics for the individual and computed RBD scale items measuring threat, efficacy and message derogation that were normally and non-normally distributed are presented in Tables 5.4 and 5.5 respectively, with the data split across the six EPPM-based message groups. For descriptive statistics of the individual items of the computed variables see Appendix V. When considering the descriptive statistics for the sample it should be noted that the data were heavily skewed. All participants reported high levels of CVD threat and efficacy appraisals for the associated health behaviours.
Table 5.4

Descriptive statistics for normally distributed threat and efficacy measures from the RBD scale from sample

<table>
<thead>
<tr>
<th>RBD Scale</th>
<th>Standard M (SD; 95% CI)</th>
<th>Low Efficacy M (SD; 95% CI)</th>
<th>Low Threat M (SD; 95% CI)</th>
<th>High Efficacy M (SD; 95% CI)</th>
<th>High Threat M (SD; 95% CI)</th>
<th>Overload M (SD; 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD Threat</td>
<td>n = 44</td>
<td>n = 44</td>
<td>n = 44</td>
<td>n = 38</td>
<td>n = 34</td>
<td>n = 45</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>9.52 (2.68; 8.71, 10.34)</td>
<td>9.22 (4.12; 7.79, 10.66)</td>
<td>8.53 (3.32; 7.52, 9.54)</td>
<td>9.74 (3.27; 8.66, 10.81)</td>
<td>9.82 (3.44; 6.62, 11.02)</td>
<td>8.87 (2.98; 7.97, 9.76)</td>
</tr>
<tr>
<td>Comparative susceptibility</td>
<td>5.41 (1.25; 4.91, 5.80)</td>
<td>5.32 (1.36; 4.91, 5.80)</td>
<td>4.91 (1.41; 4.48, 5.34)</td>
<td>5.37 (1.51; 4.87, 5.87)</td>
<td>5.24 (1.48; 4.72, 5.75)</td>
<td>5.18 (1.39; 4.72, 5.75)</td>
</tr>
<tr>
<td>Smoking</td>
<td>n = 43</td>
<td>n = 43</td>
<td>n = 43</td>
<td>n = 38</td>
<td>n = 34</td>
<td>n = 44</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>9.19 (2.61; 8.38, 9.99)</td>
<td>9.72 (2.40; 8.85, 10.58)</td>
<td>9.70 (2.70; 8.87, 10.53)</td>
<td>9.82 (2.47; 9.00, 10.63)</td>
<td>9.41 (3.36; 8.24, 10.58)</td>
<td>9.30 (2.76; 8.46, 10.13)</td>
</tr>
<tr>
<td>Behavioural intentions</td>
<td>4.63 (1.25; 4.10, 4.96)</td>
<td>4.20 (0.78; 3.77, 4.63)</td>
<td>4.45 (1.10; 3.94, 4.96)</td>
<td>4.41 (1.05; 3.94, 4.96)</td>
<td>4.65 (1.05; 3.94, 4.96)</td>
<td>4.52 (1.22; 3.94, 4.96)</td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>4.38 (1.01; 3.77, 4.63)</td>
<td>4.20 (0.78; 3.77, 4.63)</td>
<td>4.45 (1.10; 3.94, 4.96)</td>
<td>4.45 (1.06; 3.94, 4.96)</td>
<td>4.65 (1.06; 3.94, 4.96)</td>
<td>4.52 (1.22; 3.94, 4.96)</td>
</tr>
<tr>
<td>Message Derogation</td>
<td>n = 37</td>
<td>n = 31</td>
<td>n = 40</td>
<td>n = 38</td>
<td>n = 33</td>
<td>n = 45</td>
</tr>
<tr>
<td>Nervous</td>
<td>2.16 (1.71; 1.59, 2.73)</td>
<td>2.35 (1.66; 1.74, 2.97)</td>
<td>2.43 (2.16; 1.73, 3.12)</td>
<td>2.92 (1.60; 2.40, 3.45)</td>
<td>2.91 (2.07; 2.18, 3.64)</td>
<td>3.47 (2.07; 2.85, 4.08)</td>
</tr>
<tr>
<td>Anxious</td>
<td>1.95 (1.41; 1.47, 2.42)</td>
<td>2.45 (1.82; 1.78, 3.12)</td>
<td>2.38 (1.98; 1.74, 3.01)</td>
<td>2.89 (1.72; 2.33, 3.46)</td>
<td>2.85 (2.05; 2.12, 3.57)</td>
<td>3.34 (2.03; 2.74, 3.95)</td>
</tr>
<tr>
<td>First reaction: Did not</td>
<td>2.59 (1.85; 1.98, 3.21)</td>
<td>2.29 (1.55; 1.72, 2.86)</td>
<td>2.68 (2.07; 2.01, 3.24)</td>
<td>3.13 (1.86; 2.52, 3.74)</td>
<td>3.21 (2.27; 2.41, 4.02)</td>
<td>3.33 (2.05; 2.72, 3.95)</td>
</tr>
<tr>
<td>want to think about CVD</td>
<td>1.98 (3.21)</td>
<td>1.72 (2.86)</td>
<td>2.01 (3.24)</td>
<td>2.52 (3.74)</td>
<td>2.41 (4.02)</td>
<td>2.72 (3.95)</td>
</tr>
</tbody>
</table>
Table 5.5

Descriptive statistics for non-normally distributed threat and efficacy measures from the RBD Scale for sample

<table>
<thead>
<tr>
<th>RBD Scale</th>
<th>Standard Mdn (IQR(^a))</th>
<th>Low Efficacy Mdn (IQR(^a))</th>
<th>Low Threat Mdn (IQR(^a))</th>
<th>High Efficacy Mdn (IQR(^a))</th>
<th>High Threat Mdn (IQR(^a))</th>
<th>Overload Mdn (IQR(^a))</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD Threat</td>
<td>n = 44</td>
<td>n = 34</td>
<td>n = 44</td>
<td>n = 38</td>
<td>n = 34</td>
<td>n = 45</td>
</tr>
<tr>
<td>Perceived threat</td>
<td>23.00 (20.00 – 25.00)</td>
<td>25.50 (17.75 – 26.25)</td>
<td>22.00 (19.00 – 24.00)</td>
<td>23.00 (20.50 – 26.25)</td>
<td>23.00 (20.00 – 26.25)</td>
<td>22.00 (20.50 – 24.50)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>14.00 (12.00 – 14.00)</td>
<td>14.00 (12.00 – 14.00)</td>
<td>13.50 (12.00 – 14.00)</td>
<td>14.00 (12.00 – 14.00)</td>
<td>14.00 (12.00 – 14.00)</td>
<td>14.00 (13.50 – 14.00)</td>
</tr>
<tr>
<td>Comparative severity</td>
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<td>7.00 (6.00 – 7.00)</td>
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\(^a\)Interquartile range
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<td>Mdn (IQR(^a))</td>
<td>Mdn (IQR(^a))</td>
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<td>(21.00 - 27.00)</td>
<td>(20.50 - 26.00)</td>
<td>(21.75 - 27.00)</td>
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<td>(1.00 - 4.75)</td>
<td>(1.00 - 5.00)</td>
<td>(1.00 - 5.50)</td>
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<td>(1.00 - 3.00)</td>
<td>(1.00 - 3.00)</td>
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<td>(1.00 - 2.00)</td>
<td>(1.00 - 3.00)</td>
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<td>1.00</td>
<td>1.50</td>
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<td>my feelings</td>
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<td>(1.00 - 3.00)</td>
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<td>(1.00 - 3.00)</td>
<td>(1.00 - 2.00)</td>
<td>(1.00 - 4.75)</td>
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<td>(1.00 - 2.00)</td>
<td>(1.00 - 2.25)</td>
<td>(1.00 - 2.00)</td>
<td>(1.00 - 2.00)</td>
<td>(1.00 - 3.75)</td>
</tr>
</tbody>
</table>

\(^a\)Interquartile Range
Participants also reported low levels of negative emotional reactions to the CVD message (measured by three items) and message derogation (measured by four items; see section 5.2.6 for details relating to transformations). From a visual inspection of the descriptive statistics, it was not possible to establish any possible patterns among the six message groups.

5.3.3 Associations between EPPM message groups and control processes

In order to test hypotheses one and two, chi-square analyses were conducted on whether participants were deemed to be partaking in danger or fear control processes for each of the associated health behaviours (e.g., smoking, eating healthily and physical activity). See section 4.2.6 for how the discriminating variable for danger or fear control processes was calculated. No significant associations were noted for smoking, eating healthily and physical activity (see Appendix W for further details).

5.3.4 Threat and efficacy appraisals, and message derogation

Following on from the above results, to test the second aspects of hypotheses one and two, one-way between-groups ANOVAs were conducted to evaluate the effects of the six EPPM threat-to-efficacy ratio CVD messages on participants’ CVD threat and smoking efficacy appraisals, as well as their message derogation. Analyses of interest and those with significant results are described below, see Appendix X for additional analyses.

5.3.4.1 CVD threat

For participants’ threat appraisals, Levene’s test of equality of variance indicated that there was not homogeneity of variance ($F = 3.84$, $p < .01$), therefore a Kruskal-Wallis test was conducted. No significant differences were noted between the groups, $\chi^2 (df = 5) = 3.32$, $p = .652$. 
Participants were also asked to indicate their perceived comparative susceptibility and severity (transformed) for CVD. Parametric analyses were conducted on both variables; no significant differences were found between the message groups for comparative susceptibility and severity of CVD (see Appendix X).

5.3.4.2 Smoking efficacy

For perceived efficacy of smoking, Levene’s test of equality of variance indicated that there was homogeneity of variance ($F = 1.80, p = .113$). No significant differences were noted between the message groups ($F(5, 228) = 0.39, p = .853$).

Analyses were also conducted on participants’ behavioural intentions and likelihood for quitting or refraining from smoking over the next month. It should be noted that only participants who identified as current or ex-smokers were included in the analyses, and therefore the sample numbers were reduced: 1) standard (1/1 ratio, $n = 10$); 2) low efficacy (1/0 ratio, $n = 11$); 3) low threat (0/1 ratio, $n = 9$); 4) high efficacy (1/2 ratio, $n = 8$); 5) high threat (2/1 ratio, $n = 13$); and 6) overload (2/2 ratio, $n = 12$). Through non-parametric analyses, no significant differences were noted for behavioural intentions or likelihood (see Appendix X).

5.3.4.3 Message derogation

Participants were asked seven questions relating to the CVD risk information in order to access their negative emotional reactions, message derogation, avoidance and perceived manipulation by the message, as such are associated with fear-control processes. One-way between-groups ANOVAs were conducted on each measure.

A significant difference was noted between the message groups for how frightened (transformed) the CVD risk messages had made participants feel, $F(5, 219) = 3.27, p < .01, \eta^2 = 0.26$ (see Figure 5.1).
Figure 5.1. Bar graph of group means for fear (back transformed) across the six groups. Note. Error bars are based on standard error.

Pairwise comparisons were conducted to assess the differences across the groups. Gabriel’s pairwise test procedure was utilised due to differences in sample sizes (Field, 2009). Participants who received the “overload” message (2/2 ratio; $M = 2.87$, 95% CI = 2.29, 3.60) reported being significantly more frightened ($p < .01$) than those who received the “standard” message (1/1 ratio; $M = 1.63$, 95% CI = 1.30, 2.03).

Furthermore, a significant difference was found between the message groups in terms of how nervous they reported feeling after reading the CVD risk message, $F(5, 219) = 2.71$, $p < .05$, $\eta^2 = 0.24$ (see Figure 5.2). Pairwise comparisons were conducted to assess the differences across the message groups. Similar to the result above, it was noted through post-hoc comparisons (Gabriel’s procedure) that the difference between the “overload” (2/2 ratio; $M = 3.47$, 95% CI = 2.85, 4.08) and the “standard” (1/1 ratio; $M = 2.13$, 95% CI = 1.57, 2.69) message groups was significant ($p < .05$), with the “overload” group reporting more nervousness.
For participants’ reports of feeling anxious, Levene’s test of equality of variance indicated that there was not homogeneity of variance ($F = 2.48$, $p < .05$), therefore a Kruskal-Wallis test was conducted. Significant differences were found between the message groups, $\chi^2 (df = 5) = 13.49$, $p < .05$, see Figure 5.3. Pairwise comparisons (Mann Whitney U tests) were conducted to assess the potential differences across the message groups.

Because of the multiple comparisons performed, there was a highly-inflated probability of a Type I error. Therefore, a Šidák correction was utilised, and a conservative $\alpha$ value of .003 was specified for the sample comparisons rather than the more usual value of .05 (Abdi, 2007). Similar to above, it was found that the difference between the “standard” (1/1 ratio; Mean Rank = 32.64) and “overload” (2/2 ratio; Mean Rank = 48.79) message groups was statistically significant, $U = 504.50$, $p < .003$, with those who received the overload (2/2 ratio) message reporting greater feelings of anxiety.
Figure 5.3. Bar graph of group means for anxious across the six groups. Note. Error bars are based on standard error.

For the four items measuring participants’ message derogation, avoidance and perceived manipulation by the CVD risk message (three of which were transformed), parametric and non-parametric analyses revealed no significant differences or trends between the six threat-to-efficacy CVD risk messages, see Appendix X for further details.

5.3.5 Relationship between message groups and behavioural intentions

In order to examine hypothesis three, multiple regression modelling with moderation was completed to assess if the effectiveness of the EPPM threat-to-efficacy ratio messages, for behavioural intentions of eating healthily and physical activity, were affected by threat and efficacy appraisals. Participants’ health status was entered as a covariate for both sets of models. A visualisation of the two conceptual models tested is presented in Figure 5.4. Utilising the PROCESS macro for SPSS (Hayes, 2016) allowed the inclusion of a categorical predictor variable (EPPM message groups) and a categorical covariate (health status).
For the EPPM threat-to-efficacy groups, the “standard” (1/1) message group was used as the reference group, and for health status, participants who reported no on-going health problems (CVD or otherwise) were the reference group. These participants were compared to three other groups; (1) those who reported having CVD, (2) those who reported having other but non-CVD on-going health issues, and (3) those who reported both (CVD and other on-going health issues). The threat and efficacy moderator variables entered into the model were calculated as they have been for the analyses conducted for study two and the earlier analyses conducted for study three (see section 4.2.6 and 5.2.6 for details): threat was a combination of items measuring perceived personal risk of CVD, personal susceptibility of CVD, harm of CVD and severity of CVD; and perceived efficacy was a combination of two response efficacy items and two self-efficacy items.

A G*Power analysis was used to determine the optimum sample size for moderation analysis. The result of the G*Power analysis suggested a sample size of 92, to detect a medium effect size with an alpha level of .05 and with a power level of 0.80 considering five predictors (one IV, two moderators, two interactions). As the current sample size was 242, the size of the data was deemed appropriate for moderation analysis. See section 5.2.6 for how missing and skewed data were dealt with. The data
were screened for outliers using Mahalanobis, Cook’s and Leverage values. No participant was found to be an outlier on two or more of the utilised measures and therefore no action was necessary. Visual inspection of the histogram and residual plots suggested a predominantly normal distribution and linearity. Inspection of a correlation matrix revealed no problems for multi-collinearity. However, the data were heavily skewed and therefore bootstrapping of 2000 samples with bias corrected was completed as part of all regression analyses.

5.3.4.1 Eating healthily behavioural intentions

Two multiple regression models were tested to investigate if the effectiveness of the EPPM threat-to-efficacy CVD message groups for eating healthily behavioural intentions were affected by perceptions of threat first and then separately, efficacy.

In the first multiple regression model, threat was entered as the moderator variable and the overall model was found to be non-significant, $F(14, 213) = 1.40, p = .154, R^2 = .09$. In the second multiple regression model, efficacy was entered as the moderator variable and the overall model was found to be significant, $F(14, 213) = 7.15, p < .001, R^2 = .30$, explaining 30% of the variance in eating healthily behavioural intentions. A trend was noted towards efficacy as a significant predictor of the association between message groups and behavioural intentions for eating healthily, $b = .24, t(213) = 1.88, p = .061$. Among the health status groups, a significant difference was noted between those who reported having CVD and those who reported no on-going health issues, $b = .13, t(213) = 2.39, p < .05$, where those who reported having CVD were found to report higher behavioural intentions for eating healthily than those who did not report any on-going health problems. No interaction effects were found between the message groups for behavioural intentions at any levels of efficacy.
5.3.3.4 Physical activity behavioural intentions

Two multiple regression models were tested to investigate if the effectiveness of the EPPM threat-to-efficacy CVD message groups for physical activity behavioural intentions were affected by perceptions of threat first and then separately, efficacy.

In the first multiple regression model, threat was entered as the moderator variable and the overall model was found to be significant, $F(14, 211) = 2.23, p < .01$, $R^2 = .07$, explaining 7% of the variance in physical activity behavioural intentions. Although the overall model was significant, threat was not a significant predictor, $b = .10, t(211) = 1.38, p = .168$, the health status groups were not acting as a significant covariate, and no interaction effects were found between the message groups for behavioural intentions at any levels of threat.

In the second multiple regression model, efficacy was entered as the moderator variable and the overall model was found to be significant, $F(14, 211) = 6.36, p < .001$, $R^2 = .29$, explaining 29% of the variance in physical activity behavioural intentions. Efficacy was a significant predictor, $b = .12, t(211) = 1.93, p = .05$, and significant differences were noted between the “standard” (1/1) message group and the following two message groups: “high threat” (2/1), $b = .09, t(211) = 2.47, p < .05$; and “overload” (2/2), $b = .16, t(211) = 4.15, p < .001$; however, these results need to be considered in light of the significant interaction effects. Health status was not a significant covariate.

There were two significant interaction effects found. First between the levels of efficacy and the “high efficacy” (1/2) message group, $b = .22, t(211) = 2.14, p < .05$, and secondly, between the levels of efficacy and the “overload” (2/2) message group, $b = .26, t(211) = 2.85, p < .01$. Simple slopes for the association between message groups and physical activity behavioural intentions were tested for low (-1 SD below the mean), moderate (mean), and high (+1 SD above the mean) levels of efficacy. For low
levels of efficacy, a significant difference was found between the “standard” (1/1) and “overload” (2/2) message groups, $b = .06, t(211) = 2.77, p < .01$. When participants had low levels of efficacy, those in the “overload” (2/2) message group reported slightly higher intentions for physical activity than the “standard” (1/1) message group.

For medium levels of efficacy, significant differences were found between the “standard” (1/1) message group and the two following message groups: “high efficacy” (1/2), $b = .09, t(211) = 2.47, p < .05$; and “overload” (2/2), $b = .16, t (211) = 4.15, p < .001$. When levels of efficacy increased to a moderate level, the difference in intentions between the “standard” (1/1) and “overload” (2/2) message groups became more pronounced, and furthermore, those in the “high efficacy” (1/2) message group also reported higher physical activity intentions than the “standard” (1/1) message group. Similarly for high levels of efficacy, significant differences were noted between the “standard” (1/1) message group and the following two message groups: “high efficacy” (1/2), $b = .16, t(211) = 2.44, p < .05$; and “overload” (2/2), $b = .25, t(211) = 3.73, p < .001$. When participants reached high levels of efficacy for physical activity, the differences between the message groups observed at moderate efficacy levels were maintained and increased for behavioural intentions. Figure 5.5 plots the simple slopes for the interactions, and displays the increasing differences between the “standard” (1/1) message group, and the “high efficacy” (1/2) and “overload” (2/2) message groups as levels of efficacy increase.

**5.3.6 Personal and comparative susceptibility and severity of CVD**

In order to test hypothesis four and to examine if any differences existed between participants perceived personal and comparative susceptibility and severity of CVD, two within-groups t tests were conducted. The analyses were conducted to
examine if the significant difference reported in study two would be replicated in an older sample (60+ years of age).

![Graph showing simple slopes for the association between message groups and physical activity behavioural intentions at low (-1SD below the mean), moderate (mean), and high (+1SD above the mean) levels of efficacy.]

Figure 5.5. Simple slopes for the association between message groups and physical activity behavioural intentions at low (-1SD below the mean), moderate (mean), and high (+1SD above the mean) levels of efficacy.

A within-groups t-test was conducted to examine the difference between participants’ personal and comparative susceptibility. Both variables were found to be close to normally distributed and therefore suitable for parametric analyses on the original data. Descriptive statistics are presented in Table 5.6. On average, participants reported significantly lower personal susceptibility ($M = 4.86$, $SD = 1.78$, 95% CI = 4.63, 5.08) than comparative susceptibility ($M = 5.23$, $SD = 1.39$, 95% CI = 5.05, 5.41), $t(238) = -3.10$, $p < .01$, $r = 0.20$. 
Additionally, a within-groups t-test was conducted to examine the difference between participants’ personal and comparative severity for CVD. Both variables were transformed using a reflected and Log_{10} transformation, due to the data being non-normally distributed with negative skews. Descriptive statistics are presented in Table 5.6. No significant difference was found between participants’ personal and comparative severity of CVD, t(238) = 0.24, p = .812, r = 0.02.

Table 5.6

Descriptive statistics for personal and comparative susceptibility and severity of CVD

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<td>1.39</td>
<td>5.05, 5.41</td>
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*a*Interquartile range

5.3.7 Summary of results

5.3.7.1 EPPM

The results from the chi-square analyses examining control processes and the ANOVA analyses for CVD threat and smoking efficacy appraisals provided no evidence to support the EPPM; therefore, hypotheses one and two were not supported.

For fear-control processes, differences were noted between the “standard” (1/1) and “overload” (2/2) message groups for negative emotional reactions after reading the CVD message. The “overload” (2/2) message group reported higher levels of fear, nervousness and anxiety than the “standard” (1/1) message group. No evidence was found for any differences between the message groups for measures of message derogation.
5.3.7.2 Threat appraisals of CVD

Overall, the sample reported higher comparative susceptibility than personal susceptibility for CVD. The same difference was not seen for participants’ severity perceptions for CVD, therefore hypothesis four was partially supported.

5.3.7.3 Relationship between message groups and behavioural intentions

From the regression modelling with moderation, it was found that efficacy impacted the relationship between the message groups and behavioural intentions for eating healthily and physical activity. In particular, for physical activity, it was found that as participants’ levels of efficacy increased and if these individuals received high levels of efficacy information, their behavioural intentions for physical activity increased. The differences between the message groups were not exactly as predicted and therefore, hypotheses 3b and 3d were partially supported.

5.4 Discussion

The lack of direct findings from the analyses means that none of the three hypotheses based on the EPPM were fully supported. Tentative support could be given for minor expectations from hypothesis 3b and 3d; however, the results were not as expected as the main differences were seen between the “standard” (1/1) message group and the “high efficacy” (1/2) and the “overload” (2/2) message groups. These findings do highlight that efficacy may have an important role to play for communicating about physical activity to older individuals. It should be noted that similar to study two, the data were heavily skewed. In general, participants reported high threat appraisals for CVD, high efficacy appraisals for the associated health behaviours, and low levels of negative emotional reaction and message derogation. As such, the study found little evidence to support the EPPM for communicating CVD threat and efficacy information about the associated health behaviours to an older (60+ years) population. There are a
number of factors that need to be highlighted when considering these results, as discussed in the following sections.

5.4.1 Theoretical implications

The current study assessed the impact of manipulating levels of both threat and efficacy and is one of only two examinations (see Carcioppolo et al., 2013) that have completed an experimental assessment of the optimal amount of threat and efficacy information that needs to be included in EPPM-based health communications for a specific disease. The most salient theoretical and practical implications of this quantitative examination are discussed below. It should also be noted that the current study was completed on individuals over the age of 60 years due to the alleviated risk of CVD among this population (Marmot, 2003; Nichols et al., 2013). As discussed in section 5.1, there is a considerable lack of research examining fear appeals communication in older populations (Hastings et al., 2004). Therefore, the results of the current research are particularly useful for highlighting the key constructs for an older, Irish population when communicating about CVD and the associated health behaviours.

Overall, the current study found a lack of evidence to support the EPPM predominantly due to the lack of interaction effects between threat and efficacy perceptions and as there were no differences between the groups in terms of danger- and fear-control processes. As posited by Witte and colleagues (2003; 1992; 2009; 2000) a successful EPPM-based communication is one that results in danger-control processes. Quantitatively, the current study could not distinguish a ratio of threat-to-efficacy information that would be optimum for encouraging participants to partake in danger-control processes in terms of CVD and the associated health behaviours. Furthermore, results similar to those of previous studies examining threat and efficacy for disease threats and the associated health behaviours among older populations were
not replicated (Cameron et al., 2009; Carcioppolo et al., 2013; Leung et al., 2016; Miles et al., 2008; Prati et al., 2012).

5.4.1.1 Efficacy

Differences were found between the message groups in terms of participants’ efficacy perceptions for physical activity and partially for eating healthily. As discussed above it was found that as participants’ efficacy perceptions increased, those who received higher levels of efficacy information in the CVD messages were more likely to report higher levels of behaviour intentions for physical activity. In contrast for the HPV vaccine, Carcioppolo and colleagues (2013) found through mediation analysis that perceived susceptibility, rather than a measure of efficacy, partially explained HPV vaccine intentions. However, Krieger and Sarge (2013) through similar analyses found that efficacy perceptions had a greater effect on HPV vaccine intentions than threat perceptions. It should be noted that both results were found in young female participants, and the latter did not manage to replicate the finding in mothers of their young female participants who also took part in the study. The results of the current study are more in line with those of the latter and highlight the importance of efficacy when communicating to older populations about their health behaviours.

In previous research, self-efficacy has been highlighted as important for the uptake of heart healthy dietary behaviours among older populations following communication of the risks of CVD and associated behaviours (McKay et al., 2004). The current study showed the potential for a similar result, as efficacy was found to significantly moderate the relationship between the message groups and behaviour intentions for eating healthily. However, no differences were distinguished between the message groups upon further investigation. When considering the inconsistent results between the current study and previous examples, attention should be paid to the
different cohorts in the studies, the different diseases and, the varying associated health behaviours for the relevant diseases.

In comparison to the findings of other studies, the difference between the associated health behaviours in terms of their time period should also be taken into account. A number of the previous examples discussed for the use of the EPPM for communicating about risks to older individuals, are related to once-off health behaviours, e.g., cancer screening (Leung et al., 2016; Miles et al., 2008); influenza vaccination (Cameron et al., 2009; Prati et al., 2012). Health behaviours such as these and the HPV vaccine are once-off behaviours and do not require long-term effort and maintenance unlike those included in the current investigation. Previous research has shown different results for habitual versus once-off health behaviours and furthermore, differences when similar interventions are applied to one type of the former and later to one form of the latter (Jepson, Harris, Platt, & Tannahill, 2010; Michie & Abraham, 2004; Sniehotta, Scholz, & Schwarzer, 2006). Furthermore, many of the previous examples discussed above examined the once-off health behaviour in isolation.

5.4.1.2 Social factors

Similar to study two, the current investigation found that older participants perceived higher levels of comparative susceptibility for CVD than personal susceptibility. The same result was not observed for perceived severity of CVD. As discussed in section 4.1.3.1, the finding is in line with the general trend in the risk perception literature that shows quite consistently that individuals report higher perceived levels of comparative risk perceptions than personal ones (Chambers & Windschitl, 2004; Irvine & Ritvo, 1998; Klein & Stefanek, 2007; Radcliffe & Klein, 2002; Weinstein & Klein, 1995). Two previous investigations utilising the EPPM for communicating about health risks included measures of social threats and trust (Prati et
al., 2012; Smith et al., 2007). In their examination and extension of EPPM-based HIV/AIDS messages among Namibian residents, Smith et al. (2007) included measures of stigma and collective efficacy in order to determine the possible influence of such from a social perspective. Prati et al. (2012) controlled for social trust in their assessment of EPPM-based influenza vaccination messages for older individuals (65+ years).

Both studies found results to support the importance of such social factors. Prati and colleagues (2012) showed how social trust was related to perceptions, intentions and vaccine acceptance. Additionally, Smith and colleagues (2007) displayed how HIV/AIDS-related social threats combined with efficacy affected respondents’ willingness to partake in HIV/AIDS-related outcome behaviours (e.g., support others living with HIV and willingness to adopt AIDS orphans). However, both studies included measures of social threats and trust due to the possible confounding effects of such on the particular health threat under investigation. A more in-depth discussion of social influences for the EPPM, and health risk and decision-making in general is presented in chapter seven.

5.4.2 Practical implications

Similar to the results of study two, the current study contained a large amount of skewed data for most measures. In line with the younger population in study two, the older population examined in study three also reported high levels of perceived threat (across all measures of such), high levels of perceived efficacy (across all health behaviours included and all measures utilised) and then low levels of message derogation, avoidance and denial. Quantitatively, the older population were accepting of the threat information presented about CVD and did not display any marked agreement with the information being exaggerated, trying to manipulate feelings or
straining the truth. Given such it could be suggested that the shortness and the nature of the current manipulation (text-based) may not have been strong enough to influence such skewed perceptions of threat, efficacy and message derogation. Future research may consider utilising stronger manipulations in terms of the emotional content included, length of the manipulation and formats used (e.g., video, music).

As noted above differences were seen between the “standard” (1/1) and “overload” (2/2) message groups for negative emotional reactions. In the current study although participants in the “overload” (2/2) message group reported higher feelings of fear, nervousness and anxiety, such feelings did not result in message derogation of the EPPM-based CVD risk communications presented to these participants. It may be that the higher levels of efficacy information alleviated the effect of the negative emotional reactions. However as no direct effects of such were found for danger- and fear- control processes, it is not clear from the current investigation of the possible impact of such. Care may need to be taken in the future to ensure that these negative emotional reactions do not result in avoidance, denial and message derogation by individuals (Witte, 1992; Witte, 2009; Witte & Allen, 2000).

The findings of the current study raised a number of questions about the rates of health literacy among the sample. In general, participants did report high levels of threat perception of CVD, which is in line with the current rates of CVD for older individuals within Ireland and throughout Europe (Marmot, 2003; Nichols et al., 2013; Peterson & Masoudi, 2007; Townsend et al., 2015). From both the quantitative and qualitative data (see section 6.3.5), there were inconsistencies noted in participants’ reporting of their previous history of CVD. An in-depth discussion of the implications of such, along with the findings for health literacy from study two, is presented in chapter seven.
5.4.3 Limitations

The study had a number of limitations that should be noted. Firstly, the overall sample was predominantly between the ages of 65 to 72 years and were highly educated with the majority of participants having completed some form of third level education. Such factors could raise questions about the generalisability of results particularly for individuals over the age of 75 years and those without higher education. Secondly, a large proportion of the quantitative data was collected online. This was to aid in participant recruitment however it meant that the environment in which these participants completed their participation could not be controlled.

Thirdly, when considering the moderation analyses this study utilised the standard (1/1) message group as the baseline reference group following a previous example (Carcioppolo et al., 2013). There is also the possibility of utilising the overload (2/2) group as the reference group. The lack of a true control was highlighted by Stephenson and Witte (1998) as a major limitation to studies utilising the EPPM. The current research chose the standard (1/1) group as the control or reference group; however, future research may consider the possibility of utilising the overload (2/2) group for such or a no information group. Fourthly, as previously highlighted the data were heavily skewed, and transformations and bootstrapping had to be completed to allow parametric analyses to be conducted.

5.4.4 Conclusions and future research

Quantitatively, the current study provided little evidence to support the use of the EPPM for communicating risks of CVD and efficacy information about the associated health behaviours among older individuals. However, similar to study two, the data for threat and efficacy appraisals, and assessments of the health information were heavily skewed. Study three did not manage to replicate the findings of
Carioppolo and colleagues (2013) for communicating CVD threat and efficacy information, and it was not possible to distinguish one of the six EPPM threat-to-efficacy ratio messages as the optimum or most effective for communicating such. Efficacy was noted as playing a role for short-term behavioural intentions for physical activity. As mentioned above given the lack of quantitative results, it is difficult to determine the reasons for such. In order to gain further insight into the possible causes for the ineffectiveness of the EPPM-based CVD communications, a qualitative aspect was added to the current investigation and a “think aloud” methodology was employed to examine the thought processes occurring while participants read the CVD message and completed the subsequent measures of threat, efficacy and message derogation (see chapter six).
Chapter 6: Testing EPPM Propositions among an At-Risk Population, Part Two

6.1 Introduction

Study three utilised a mixed method approach to examine EPPM threat-to-efficacy ratio messages about CVD threat and efficacy about the associated health behaviours. The current chapter focuses on the qualitative aspect of the mixed method approach.

6.1.1 Think aloud

For the qualitative approach, a think aloud methodology, in line with protocol analysis (Ericsson & Simon, 1993, 1998), was employed in order to gain further insight into the conscious thoughts of participants as they read the CVD message and completed the RBD scale. The think aloud methodology has been used in the past by a number of researchers to elucidate in detail the thinking and problem-solving processes entered into by individuals when presented with various types of information, risks and decisions (Bostrom, Atman, Fischhoff, & Morgan, 1994; Crutcher, 1994; Earle, 2004; Payne, 1994; Veldwijk et al., 2016). Building from such the method has been used across a range of diseases and behaviours, such as cancer, HIV, diabetes, and fruit and vegetable intake, in order to better understand information processing and decision-making processes for individuals in relation to their health (Allan, Scheidt, & Smith, 2014; Anderson-Lister & Treharne, 2014; French & Hevey, 2008; Henry, Reimer, Smith, & Reicks, 2006; Schnall, John, & Carballo-Dieguez, 2016; Scott, Weinman, & Grunfeld, 2011). Furthermore, it has been used by researchers to aid in the development of the most effective in-person and online health communications from the perspective of the individual and the medical professional (Backlund, Skånér, Montgomery, Bring, & Strender, 2004; Hopmans et al., 2014).
Utilising a think aloud methodology, Bonner et al. (2014) examined the possible differences between presenting CVD risk information as “heart age” compared to 5-year percentage risk based on the Framingham risk equations within online CVD risk calculators. The study found that in spite of high levels of misinterpretation and confusion among the older (40 – 67 years) participants for the risk factor questions based on both formats the information included in the calculator did encourage individuals to begin thinking about lifestyle changes for living a more heart-healthily life. Furthermore, a recent think aloud investigation found that adults with Type 2 diabetes reacted with a range of cognitive and emotional processes while working through an online CVD risk factors programme (Nolan et al., 2015). Many of the diabetic patients expressed surprise at the information presented within the calculator. A contrast was noted between patients depending on their pre-existing beliefs before completing the calculator. Those who reported more optimistic pre-existing beliefs compared to the information included in the calculator expressed more feelings of worry and anxiety while reading the information, and those who reported less optimistic pre-existing beliefs in comparison to the information included in the calculator, expressed more feelings of cheer and encouragement (Nolan et al., 2015).

It should be noted that participants in the above example already had a diagnosis of Type 2 diabetes, which may have impacted on their CVD threat appraisals. In a study that examined general information processing among older individuals (50+ years) for an online diagnosis tool for acute health conditions, Luger, Houston, and Suls (2014) found that participants didn’t feel confident in the diagnosis they reached due to confusion with the diagnosis tool. It was noted that participants who expressed higher levels of confusion and inaccuracy with the diagnosis tool were more likely to rely on their own past illnesses experiences to guide them in their decision-making (Luger et
Utilising the SRMI (Leventhal, 1970), the authors attributed the finding to the use of heuristics by participants based on their previous experiences. Additionally, they suggested that the confusion and inaccuracy was arising from difficulty with using the online diagnosis tool. However, it is possible that participants were partaking in defensive processing in reaction to the diagnostic information (Witte, 1992; Witte et al., 2001). No measures of such were included in the study; therefore it is not possible to make a definite conclusion. It should be noted that a number of previous think aloud investigations have reported high levels of confusion and uncertainty by participants in their risk perceptions and decision-making processes. In spite of such though, the think aloud findings have emphasised the role of positive emotional reactions, increases in awareness and contemplation of behaviour change for CVD and the associated health behaviours (Bonner et al., 2014; Luger et al., 2014; Nolan et al., 2015).

6.1.2 Objective

Given the gaps in the literature on the EPPM (see section 5.1.2), the lack of quantitative evidence to support the EPPM from study two and part one of study three, and the very few previous qualitative analyses of the EPPM, a ‘think aloud’ methodology was employed in order to give further insight into the possible influencing factors on thinking and problem-solving processes when assessing EPPM-based CVD messages.

6.2 Method

6.2.1 Design

The same design as that of the quantitative approach was employed; however, qualitative methods were used for data collection. Participants were randomly assigned to one of the same six EPPM-based threat-to-efficacy ratio groups as those of the quantitative approach (see section 5.2.1). A ‘think aloud’ procedure was utilised in
order to better elucidate participant responses. The use of the think aloud procedure was approved by the ethics committee in the School of Psychology, TCD (see Appendix A).

6.2.2 Participants

6.2.2.1 Eligibility criteria

See section 5.2.2.1.

6.2.2.2 Recruitment

See section 5.2.2.2 for recruitment procedures. Participants who contacted the main researcher directly were informed that they could complete the study online or in person. Participants who expressed a preference for the in-person interview were informed of the think aloud procedure and asked if they would be willing to partake in such. They were informed that the testing session would be audio-recorded, and that all information and recordings would be kept anonymous and confidential. For those who consented, a testing session was arranged at a time convenient for the participant. After examining examples from previous research (Bonner et al., 2014; Nolan et al., 2015), a sample size of 12 to 18 was the initial aim. However, as the research design included six groups, four participants per group were recruited ($N = 24$, Female = 14; Age, $M = 74.38$, $SD = 7.16$). This was done in order to allow adequate confidence in the results and trends noted within the data across the six message groups.

6.2.3 Materials

See section 5.2.3.

6.2.4 Measures

See section 5.2.4.

6.2.5 Data collection

The think aloud testing sessions were conducted between June and August 2016. All sessions were conducted in testing rooms within the School of Psychology, TCD.
and were completed by the main researcher and two trained research assistants. Sessions varied in length from 15 to 30 minutes.

6.2.6 Procedure

Participants were first asked to read the information sheet, which was modified from the original to reflect the change in methods (see Appendix Y). They were informed of the nature of the study, reminded that they would be asked to ‘think aloud’ their responses and that the session would be audio recorded. Additionally, participants were reminded that they could withdraw from the study at any stage without penalty if they so wished. After reading the information sheet, participants were asked to complete the consent form if they were happy to proceed (same as quantitative method). Following this if full consent had been given, the researcher began the recording and participants were asked to complete the demographics and health questionnaire (same as quantitative method).

After completion of the demographics and health questionnaire, participants were presented with one of the six EPPM-based CVD risk information. Participants were given the following instruction before reading the EPPM-based CVD risk message: “Please read and consider the following health information about cardiovascular disease. Please read the message aloud and ‘think aloud’ any of your thoughts as you do so. Say aloud anything that comes to mind as you read the health information.” If participants needed further instructions, they were given the following: “What I mean by ‘think aloud’ is that you say aloud anything that comes to mind as you read the message and while answering the questions.” If participants became quiet, they were prompted to “keep talking” or asked if they had “any thoughts on the message or question”.
After reading the CVD risk information, participants were asked to complete the RBD scale. Due to the number of measures within the questionnaire, it was split across five pages; 1) questions relating the CVD risk perception; 2) questions relating to smoking; 3) questions relating to eating healthily; 4) questions relating to physical activity; and 5) questions relating to the health information. Participants were given the following instructions before beginning the questionnaire: “As you are completing the questionnaire, please say aloud each question and then ‘think aloud’ your thoughts as you give your answer – why are you answering the way that you are?” If participants became quiet, they were prompted to “Keep talking” or asked, “Why did you answer that way?”

Once participants had worked their way through the RBD scale, the recording was stopped, they were debriefed (same as quantitative method), thanked for their participation, and given the contact details of the researcher should they have any questions about the study at a later date.

6.2.7 Analysis

A thematic analysis was conducted in accordance with the steps outlined by Braun and Clarke (2006) and taking into consideration the guidelines of Yoder and Simmons (2010) for developing coding frameworks. The recordings of each participant were transcribed verbatim. The main researcher and a trained research assistant conducted thematic analysis. Transcriptions were segmented, in accordance with think aloud procedures (Ericsson & Simon, 1993), into six main sections based on the procedure of the study: 1) before reading the CVD risk message; 2) reading the CVD risk message; 3) questions related to CVD, 5) questions related to health behaviours (smoking, eating healthily and physical activity), and 6) questions related to the CVD
message. As participants read the CVD message and each question out loud before responding, segmentation was unproblematic.

Based on an in-depth reading of the first think aloud session and the main concepts of the EPPM, a number of preliminary themes were selected as a starting point for the thematic analysis: 1) threat: perceived severity; 2) threat: perceived susceptibility; 3) self-efficacy; 4) perceived efficacy; 5) affect; 6) cognitions; 7) history; and 8) future intentions. These themes and definitions of such were provided to both coders. Each transcription was read closely a number of times before beginning coding, and themes were assigned to all content that appeared significant. Although a number of themes were identified as important initially, coders were instructed to remain open to new and emerging themes (Braun & Clarke, 2006). These were added to the initial themes and brief descriptions were drafted for their definitions. After initially transcribing and coding two transcriptions each, a meeting was organised between the two coders to compare the data, both within and across themes. Following in-depth discussion of the preliminary themes and participants’ data, themes were subsequently refined, created, and deleted as needed.

The final coding framework for the thematic analysis developed in a flexible manner (Braun & Clarke, 2006), based on the theoretical concept of the EPPM and what could be identified within the data itself through the trained coders’ experience and knowledge (Alasuutari, 1996). The final coding framework was established based on themes from the EPPM, topics that arose throughout the testing session from participants around CVD, and concepts related to the interview procedure and design (see Appendix Z). This coding framework was then applied to all 24 transcriptions. The transcriptions of three participants were coded by both coders utilising the final coding framework and were analysed in order to determine inter-coder agreement (over 20% of
the data in accordance with previous guidelines; Bakeman & Quera, 2011; Hallgren, 2012). Cohen’s $\kappa$ was run to determine if there was agreement between the two coders on their administration of the final coding framework. It was found that there was strong agreement between the two coders, $\kappa = .825$, $p < .001$, according to the guidelines of Bakeman and Quera (2011).

### 6.3 Findings

The findings from the most salient themes of danger- and fear-control-processes, threat, efficacy, CVD associated factors, and health literacy, along with their subthemes, are presented in the following sections.

#### 6.3.1 Danger- and fear-control processes

##### 6.3.1.1 Summary

Throughout the process of the in-person testing session, it was noted that interviewees took part in specific danger- and fear-control processes. Among the danger-control processes, increases in beliefs and awareness were particularly relevant. Avoidance and denial were the most common fear-control processes employed by interviewees. No pattern among the message groups could be identified for either danger- or fear-control processes.

##### 6.3.1.2 Danger-control processes

##### 6.3.1.2.1 Beliefs

Interviewees from across a range of the message groups mentioned that the message had made them more “thoughtful” (Interviewee 05, Low Threat) or had made them “more aware” (Interviewee 01, Standard). Similar phrases were also mentioned by some, “It’s been making me think” (Interviewee 20, Low Threat), “I suppose I kind of knew the facts before but it struck me forcefully this time.” (Interviewee 23, Overload) and “food for thought…. wake up call” (Interviewee 02, High Efficacy).
Furthermore, a number of interviewees went on to discuss the impact of an increase in awareness and beliefs about the threat of CVD and associated health behaviours:

*It reminds you too about em, we can all get lazy and forget sometimes, so it makes you aware of you know? It reinforces the message about em, good diet and exercise, reminds you really.* (Interviewee 12, Overload)

*I always want to think about it so that I make sure I do whatever I possibly can, to take all the steps that are necessary to deal with it right and properly.* (Interviewee 01, Standard)

*I will be going out of here in a different frame of mind.* (Interviewee 14, Standard)

### 6.3.1.3 Fear-control processes

#### 6.3.1.3.1 Avoidance

Three interviewees from three different message groups were found to employ blocking of thoughts, avoidance of other people and information sources, and religion as methods for avoiding unwanted thoughts and information about threat perceptions of CVD:

*I don’t read up about it now at all or anything like that, you know. Certainly don’t want to listen to other people’s situations about it either.* (Interviewee 19, Low Efficacy)

*I prefer not to think about it, particularly. It brings home realities to me about family... and death.* (Interviewee 23, Overload)

*I say a rosary, any problem goes away.* (Interviewee 08, Standard)

In the process of two interviews, humour was used by interviewees to avoid answering the posed question about CVD:
The, the, there’s not to, to, to my knowledge any cardiovascular em. With that he drops dead of a heart attack... The information about cardio, cardiovascular disease tried to, to strain the truth. [laughs] With a sieve? (Interviewee 02, High Efficacy)

Can I lie? [laughing] Mmh, I don’t tell lies, yeah.” (Interviewee 07, Overload)

6.3.1.3.2 Denial

It was found that two interviewees while discussing their previous history of CVD and other on-going health issues displayed denial. While disclosing the treatment that they had received for high cholesterol and an underactive thyroid, one interviewee stated:

I don’t regard them as problems. (Interviewee 16, High Efficacy)

The extract below displays a large case of denial while an interviewee discussed his own previous cardiac event:

It’s fifteen years since I had the heart attack and it was a particularly damaging one. The doctor said if, if you showed the charts of my heart to medical students, they would say that man died, and that of course works the other way, they would say that man, I mean it’s not pure math or whatever... So this, this part of it really doesn’t apply to me, and I’ve lived for fifteen years now since I had that heart attack, so I, I think I’d just, this, well yeah, the personal burden of em heart failure is great, this false statement does not apply in my case... I mean I know it’s statistical, like; I mean frequency... [but] in my particular case it doesn’t apply. (Interviewee 17, High Threat)
6.3.2 Threat

6.3.2.1 Summary

When discussing their perceived susceptibility and severity of CVD, it was noted that the majority of interviewees made use of comparative examples from family, friends and the general population to base their own personal perceptions on. When interviewees did discuss their personal susceptibility, the impact of aging and inevitability of developing an illness of one kind or another due to aging was noted. A number of interviewees mentioned hereditary as a factor within the susceptibility of CVD, and stark differences between threat perceptions for different CVD manifestations (e.g., stroke versus heart attack) were evident throughout the interviews. As discussed in previous, and forthcoming sections (e.g., 5.2.6 and 5.6.1.4), in general participants reported high threat perceptions of CVD. This was reflected in interviews as displayed quite succinctly by one participant after reading the CVD risk message and when discussing the susceptibility of CVD:

\[ I \text{ suppose we all think we're at risk. (Interviewee 07, Overload)} \]

However, what follows is a presentation and description of the main findings that arose from the think aloud interviews that can give further insight and greater understanding of the factors impacting these high threat perceptions.

6.3.2.2 Personal versus comparative threat

Interviewees were asked about their personal and family history of CVD, along with their personal and comparative threat perceptions of CVD. It was noted that the majority of participants brought up comparative examples when discussing general information about CVD, as well as the personal and comparative aspects of such. There was a considerable lack of personal discussion of CVD and its impact. Three
participants when asked about their personal susceptibility to CVD did acknowledge a pre-existing condition and the influence of such on their personal susceptibility:

That’s the main thing I suppose in my life... This is very hard sorting these things... I am at risk for getting cardiovascular disease at some stage in my life. Strongly agree. I eh sorry... oh I, well I have it in a way so I strongly agree...

Probably yeah, although I, I feel I have some already ya know? Cardiovascular. (Interviewee 01, Standard)

Yeah, I am at risk, well I already have it. So, I am at risk for getting cardiovascular disease at some stage in my life. But I have it already... Well I have it with me the whole time. (Interviewee 13, Low Efficacy)

I probably am somewhere because I mean, because I’ve had it before. (Interviewee 18, Standard)

These interviewees displayed an acceptance of their previous history of CVD and the influence of such on their susceptibility perceptions; however, they go against the general trend of comparative examples for threat perceptions and the themes of health literacy described later in section 6.3.5.

Although interviewees did discuss their own CVD problems when asked and in response to the measure of personal susceptibility and severity, it was noted within the data that a large number of interviewees drew on examples or comparisons from their family, friends and general references to ‘others’. Before being asked about comparative susceptibility and severity, while reading the information about CVD in the EPPM-based risk message, interviewees irrespective of which message group they had been randomly assigned to, consistently raised examples from family or friends to discuss threat perceptions of CVD. Interviewees discussed the prevalence of cardiac events and medication and treatment for CVD among family members and friends:
Seen friends and, around me who, who, who are aligning as well and other, other ways and some of them have eh cardio, cardiovascular eh problems. (Interviewee 02, High Efficacy)

I’d do that on a sort of historical knowledge that people that I know or eh, and some of them, you say, gosh it’s no surprise he had a heart attack and others, you’d say my goodness, he did everything right you know and there you go. (Interviewee 06, Low Efficacy)

There is a lot of people after getting stents in. (Interviewee 10, High Efficacy)

Well, the persons that I know who are around the same age as I have [sic], who are just past seventy, many of them are taking medication. They may not have had a heart attack or a bypass or whatever; lots of them have stents; and lots of them are on medication. (Interviewee 19, Low Efficacy)

A contrast was noted among the interviewees. In the examples above, interviewees discussed the high rates of CVD and treatment for such in quite a general manner and without mention of any serious or negative consequences. Other interviewees discussed the high prevalence rates and the severity of such on others in terms of the functionality, quality of life, the effects on other family members and death:

I have seen, in my life, I have seen people dying em with, my mother died of a stroke and I have seen loads of people. (Interviewee 05, Low Threat)

I’ve known a few people that ya know have died... and they were very healthy, did everything, you know didn’t smoke or didn’t drink. (Interviewee 11, High Threat)
Somebody eh, close to me has had eh, heart problems and eh it’s, limits them...

In certain things they do, so... and there would be a severe health problem.

(Interviewee 06, Low Efficacy)

I’m remembering my friends. (Interviewee 20, Low Threat)

The majority of comparative perceptions were used by interviewees to highlight the prevalence of CVD and the large number of friends and/or family that either had symptoms of CVD, were on medication or had received treatment for such, and/or died due to CVD. One interviewee in particular used a comparative example of CVD in order to anchor their own personal threat perception:

When you hear of somebody having things like that you kind of go oh, I don’t want that to happen to me. (Interviewee, 03, High Threat)

When considering susceptibility and severity of CVD, interviewees were more likely to use comparative examples from their close social networks (e.g., family member or general reference to a group of friends) as can be seen in the examples above. General referrals to CVD at a greater societal level where not common for threat perceptions. They were noted more for the associated health behaviours as discussed below, see section 6.3.2. Two interviewees, both of whom were presented with the overload (2/2 ratio) message highlighted the impact of lifestyle factors at a larger societal on rates and susceptibility of CVD:

I think in Ireland we have a huge amount of cardiovascular and stroke and it’s all so preventable. (Interviewee 04, Overload)

I think generally as a lifestyle in Ireland... we put ourselves at risk. (Interviewee 23, Overload)
6.3.2.3 Susceptibility due to aging

A common trend among interviewees was a general susceptibility to health problems due to aging. Interviewees discussed their awareness of aging and inevitable death; however, they did not discuss this in relation to CVD specifically. A number of references were made to thoughts and awareness of aging, and only one participant expressed a negative feeling (e.g., dread) towards such:

*When you get to 77 you, you, you would be conscious of a lot of things.*

(Interviewee 06, Low Efficacy)

*So I’m becoming more aware as I get older... I’m getting older and I have to think about it.* (Interviewee 07, Overload)

*Because I mean talking to people again of my own age, like we’re, we all dread, we don’t know how we’re going to finish up and we’d see some of our, some of our friends, the way they’re; you know, the problems that they have had.*

(Interviewee 18, Standard)

Comparisons were made by two interviewees to when they were younger, and the differences now in their health awareness as they get older. One participant did express a feeling of regret in relation to taking action sooner to prevent the level of treatment currently needed to control the symptoms of CVD:

*I suppose that, that, the age I am now I’m, I’m more, I’m more health conscious... I’m a little more em, more, em, a little, I’ve more time for me to think about me [sic] health.* (Interviewee 02, High Efficacy)

*I suppose if I had’ve been, in my younger years if I had have taken more heed of things, you know, that I should have been doing I mightn’t be on so many tablets.* (Interviewee 05, Low Threat)
Following on from such, it was noted that two participants expressed how the awareness of aging was impacting on their motivation for self-care and in carrying out health behaviours. Increases in awareness due to aging were linked to greater motivation to take part in the associated health behaviours so as to avoid early death and have a longer life:

*So you have to decide yourself do you want a long life? It’s up to you to do it...*

*Once you get to a certain age you, have to look after yourself more... I don’t want to go yet, an awful lot of living to do still... I understand that if I don’t exercise, if I don’t do, you know, have the healthy diet, I’m not going to live very long.* (Interviewee 15, Low Efficacy)

*There are some, I don’t know that the older people are bad, though, I think older people are quite aware of exercise, am I right? Now I may be wrong but the sort of, the people I know now all... try to take walks. I’ve seen big differences. I think it can... be, effect on the type of people maybe, em but yeah, I think there is maybe a little bit more of an awareness in the older community than there might be in the younger.* (Interviewee 24, High Efficacy)

In opposition to these two interviewees, a number of others emphasised the inevitability of death and contracting some form of illness while aging. The majority of interviewees made reference to general health problems or issues, only one interviewee stated an inevitability of getting CVD. Linked with such a lack of efficacy in the associated health behaviours was expressed:

*At this stage of life, after saying, I don’t feel, you know at some, at some stage something is going to hit you... something will have to kill ya... and, and how long do you want to live?* (Interviewee 10, High Efficacy)
You’re bound to get something you know... No, you do wonder at my age, what will happen? You know, you are aware of mortality, it’s going to come to us all, at some stage. (Interviewee 16, High Efficacy)

You, you would, you’d have other people with cardiovascular, if they’re telling the truth, if they are as old as me. They’d have to, but they’re near the end of their lives anyway. I mean I’m 78, so it’s high time I got something. (Interviewee 13, Low Efficacy)

The inevitability expressed by interviewees and the lack of efficacy for the associated health behaviours with such suggested a lack of control among interviewees over their health outcomes. For a number of interviewees this was linked to a certain amount of rumination over the topic and negative emotional reactions (e.g. dread and fear of being a burden). One exception was found among the interviewees who expressed such in a positive frame:

At this stage I don’t give a fiddler’s what happens, I’m so lucky. (Interviewee 22, Low Threat)

The fear of being a burden or causing disruption to family members due to the inevitable health outcomes of aging was a common thread among the interviewees:

Well I live on my own... I’ve no-one. I don’t want us to be a burden to anybody. You’ve probably heard that phrase before. No I, I, it would pose a problem because I am very independent. (Interviewee 11, High Threat)

You would need somebody to look after you em, and em, my husband now, he’s coming up to 70 and all my family, they’re all rearing their young children, so I would hate to put, em, responsibility on to them. They’re in the throes of leading their own life and rearing children and I do think about it, I do. (Interviewee 12, Overload)
I’m very active with the active retirement people, I’m very active with them, eh, in, socially and in lots of other ways as well and em, like if I had to give that up I think I’d go nuts... I wouldn’t like to burden to them [in reference to three daughters]. (Interviewee 18, Standard)

6.3.2.4 Differences in threat perceptions

A key finding from the interviewees was the difference in threat perceptions of different CVD manifestations, in particular for stroke versus other CVD manifestations. Interviewees compared stroke to other CVD manifestations and expressed strong dislike and negative emotional reactions to the former:

I don’t like stroke. I don’t like it. I don’t like the immobility and the dignity that you lose. Heart attacks don’t frighten me as much. (Interviewee 04, Overload)

Thoughts of having a stroke would make anyone nervous. (Interviewee 14, Standard)

I don’t mind, well, I won’t say don’t mind, but if you have a heart attack in my view, you either live or die. A stroke can be like my aunt, a living death. So I’m much more scared about a stroke; than I am about a heart attack. (Interviewee 17, High Threat)

Along with the lack of fear of heart attacks versus strokes, two interviewees discussed the benefits of death from an immediate cardiac event versus a stroke:

It’s, it’s, [pause] to tell you the truth now I’m going to be eighty-one in September, am I bothered now what takes me? It would be a nice quick way to go. (Interviewee 22, Low Threat)

In fairness a few advantages of it, you know, sudden death isn’t too bad either. (Interviewee 23, Overload)
The difference in threat perceptions for stroke and the strong negative emotional reactions were linked to interviewees’ perceptions of the consequences of a stroke. Similar to their discussion of general CVD threat perceptions, interviewees drew on comparative examples of family and friends to explain such:

I would say for anyone really who’s after having their health and to be struck down with either heart or em, a stroke, a stroke is, can be very debilitating. My mum em, took a stroke at 81 and em, while her. This was, she couldn’t eat right, she would live for 10 year with it because she lived until she was 91. She had a very strong heart and her brain wasn’t, her verbal wasn’t, she couldn’t eat. That was the way she was. (Interviewee 12, Overload)

Well like course you could be left an invalid, you could be left a stroke, you could, you know... A stroke comes on like a twitch in the night... The thoughts, now frightening, the very thoughts are very frightening at the thoughts of it, if you wake up in the morning with a stroke. Especially because I live on my own and the thoughts of it. I try not think about it now. (Interviewee 14, Standard)

Coupled with the fear of being a burden due to aging, interviewees emphasised the considerable impact of a stroke on their own personal functionality, with one interviewee using the word “immobilised” (Interviewee 04, Overload) to describe the consequences of a stroke, and what that would entail for family members:

You would hate, you would hate to take a stroke and you would be left as eh, somebody, trouble to somebody. (Interviewee 10, High Efficacy)

I think that people are very, eh, aware of getting strokes, rather than, than getting heart attacks... Well, yeah, but they won’t think in terms of a heart attack. They will think in terms of having a stroke because it makes, people have problems afterwards, you see, you would think more of a heart attack as
goodbye. The other is because they don’t want to be problems to their children by being incapacitated… with a stroke. I think they’d all feel the same way. (Interviewee 24, High Efficacy)

This is in contrast to the description given by one interviewee of the functionality of others after they had treatment for other forms of CVD:

There is a lot of people after getting stents in, you don’t, you forget that they are after having heart problems because they get their stents in and they are jumping around again, and there not a bother on them kind of, but you forget really. (Interviewee 10, High Efficacy)

Two interviewees discussed examples from interactions with medical professionals where this stark difference in threat perceptions for stroke versus other CVD manifestations was utilised as a motivating factor for medication adherence:

Doctor [name] is my cardiologist at the [hospital]… but I remember asking him one time could I come off Warfarin. He said, “You could, but I regard it as a principle defence against a stroke. (Interviewee 17, High Threat)

I don’t like taking tablets and I sort of half sort of said [to the doctor], “Are you sure I have to take these?” And he said, “No, no, you needn’t bother, you can go home and have a stroke.” So that, that was just the jokingly way he put it to me. (Interviewee 24, High Efficacy)

Throughout the interviews, a couple of references to gender differences for CVD were made. The stereotype of CVD as a masculine disease, in particular cardiac events, and a comparison to cancer was highlighted. However, the reactions or impact of such were not as negative or extreme as those discussed above for stroke:

Men all think they are going to get a heart attack, well the men I know [laughing]. (Interviewee 16, High Efficacy)
Maybe women don’t have as much problem, it could be cancer there... But, if, very rarely hear of, women dying of heart attacks. (Interviewee 21, High Threat) Certainly females are more inclined to be thinking of arthritis and... things like falls... and, and their, their, that their lifestyle will be changed more likely by falling... out walking or, they’re conscious of that and they’re also conscious of their weight a little bit. (Interviewee 24, High Efficacy)

Three interviewees believed that they were more susceptible to cancer than CVD. One interviewee when discussing the comparative susceptibility for CVD stated that the level of susceptibility was quite high, but only “if cancer doesn’t get them” (Interviewee 22, Low Threat). Interviewees’ reasoning for greater cancer susceptibility were based on their beliefs that the rates of cancer in the general population were higher than those for CVD and due to a family history of cancer rather than CVD:

Cardiovascular disease could be a severe health problem for me. I don’t think so. I am much more likely to die of cancer. (Interviewee 08, Standard) Because my family didn’t have heart attack, my father died of eh cancer... My brothers, sisters and uncles and cousins, anybody that died belonging to me died from cancer. (Interviewee 18, Standard)

6.3.3 Efficacy

6.3.3.1 Summary

As with threat perceptions and in line with the quantitative data, interviewees in general reported high levels of efficacy for the associated health behaviours (e.g., smoking, eating healthily and physical activity; see sections 5.2.6 and 5.6.1). A similar trend was reflected for the majority of interviewees, as encompassed by the following quote from one individual:
I’m pleased to say that I think I do look after myself with exercise and the fact
that I don’t smoke. I don’t drink very much, you know, occasionally. Managing
and coping with stress, which I think I have a good handle on. (Interviewee 03,
High Threat)

The main findings in relation to interviewees’ efficacy perceptions and their health behaviours that could not be gauged from the quantitative data are discussed below. Three themes were found to be consistent across the three health behaviours: the combined effectiveness of the relevant health behaviours, inconsistencies in maintaining health behaviours and the need for motivation, and the use of comparative examples when discussing the efficacy of particular health behaviours. These are discussed drawing on examples from all three health behaviours. Furthermore, a number of themes were found to be prominent for individual health behaviours, and these are presented with examples from their health behaviour.

6.3.3.2 Combined effectiveness of health behaviours

Consistently across the different health behaviours, interviewees raised beliefs that the particular individual health behaviours by itself was not enough to prevent or deter CVD. This view was expressed slightly more for smoking; however, it was consistently referred to by interviews across the three health behaviours and even when all three were taken together:

I’m thinking eh, is it the only thing? (Interviewee 03, High Threat)

It does help but it may not be the whole factor. (Interviewee 04, Overload)

Even if I took up a healthy diet, continued a healthy diet, exercised and did everything that’s recommended, I still couldn’t guarantee I wouldn’t have [CVD]. (Interviewee 06, Low Efficacy)
Well it contributes, I think there are many more factors then just smoking, I guess smoking is very important though. (Interviewee 08, Standard)

6.3.3.3 Inconsistencies in maintaining health behaviours and need for motivation

A common theme for interviewees when discussing the efficacy of the health behaviours was to discuss inconsistencies in maintaining the health behaviours over a particular time period. In general, interviewees used personal references and examples to discuss their lapses in maintaining a healthy diet, carrying out physical activity and limiting alcohol intake:

I know what, you know, I, I understand about it and I understand... how easy it is to kind of float off and go away from diets. (Interviewee 21, High Threat)

I’m very conscientious about starting a healthy diet... Then I drop off very quickly. (Interviewee 06, Low Efficacy)

Limiting alcohol, it’s limited anyway... would be it, maybe on a girls’ night out I might have a couple of drinks but... Being physically active, not very, but I try to. (Interviewee 20, Low Threat)

Interviewees attempted to use humour when discussing such and spoke in a joking manner about being “good”. It should be noted that these two interviewees would have received the larger amounts of efficacy information in their CVD messages:

I’m a good boy most of the time. (Interviewee 02, High Efficacy)

I’m hoping to be a better girl. (Interviewee 04, Overload)

Although it was a common theme to discuss lapses in health behaviour maintenance, only a few interviewees provided explanations for their lapses. General lifestyle activities and habits were the main explanation given. In reference to eating
healthily, two interviewees did discuss the attractiveness of food and giving into cravings as their reasons:

*Just running around and being busy and you sometimes don’t eat. I try my best, but like everything.* (Interviewee 07, Overload)

*I find a lot of food can, can, well not a huge amount, but some foods, eh look and seem and taste attractive… and I find it hard to... to refuse them.* (Interviewee 06, Low Efficacy)

*I get a longing and once I start, I can’t stop. That’s my problem... and I’m not disciplined enough to just eat two.* (Interviewee 11, High Threat)

Coupled with the discussions of inconsistencies in maintaining health behaviours, it was noted that interviewees made a large number of references to the need for motivation and discipline in order to carry out such:

*If I make up my mind I don’t find it difficult but making up, you know, there’s... getting the determination.* (Interviewee 05, Low Threat)

One interviewee in particular emphasised that there was a “responsibility” to each individual in order to carry out the relevant health behaviours if they wanted to take care of their health:

*I think people have, a bit of responsibility for certain parts of their own health, the exercise and smoking and, the diet and, it’s up to ourselves... I feel quite strongly that people are responsible, a lot, for their own health.*” (Interviewee 16, High Efficacy)

Unlike the discussions around inconsistencies in maintaining health behaviours though, it was noted that when discussing the need for motivation, commitment or discipline interviewees were more likely to speak in general terms and refer to others rather than the self:
It is easy, if you’re motivated. (Interviewee 04, Overload)

You have to have the motivation. Not everyone has the motivation for exercise. (Interviewee 12, Overload)

It depends on how seriously you’re into it... That’s mind over matter. If you want to do it, you’ll do it. (Interviewee 21, High Threat)

6.3.3.4 Comparative efficacy

Similar to their discussions of CVD threat perceptions, interviewees used a large number of comparative examples from family and friends to highlight the efficacy of each health behaviour:

I am saying that because some of my own family, brothers, sisters and some of my children, they smoke and you can see the difference between... the ones that smoke and the ones that don’t. (Interviewee 15, Low Efficacy)

I suppose it’s fair to say that I’ve lost a few friends from cardiovascular disease who ate much less than me and exercised much more than me. (Interviewee 06, Low Efficacy)

I suppose from people that I’ve known who lived a strong, very active life... I’m not sure that I know of anybody who has had, em, well, very, very few have had a heart attack or a stroke... for those who’ve lived, who’ve had a... very active life. (Interviewee 23, Overload)

Interviewees drew on individual and general comparative examples to present arguments for and against the efficacy of each health behaviour, and a number of interviewees presented ‘man-who’ arguments against such:

Although my own grandmother lived to 84 and she smoked 20 to 30 a day in a holder... health and her mind was as clear as a bell. So, she goes, contra, she goes against all this. (Interviewee 13, Low Efficacy)
I know people who eat unhealthily, and em, seem to have no cardiovascular disease, no cholesterol problems, nothing. They mightn’t be quite as old as myself, but they’d be old enough and they don’t. (Interviewee 13, Low Efficacy)

Even though you see these runners and walkers and they, they get their heart attacks as well... skinny whippets. I know them. (Interviewee 10, High Efficacy)

6.3.3.5 Smoking

The sub-themes discussed in the above sections were found to be consistent across all health behaviours; however, a number of findings arose that were specific to particular health behaviours. In terms of smoking, generally interviewees expressed a strong dislike towards such. Words and phrases such as “hate” (Interviewee 01, Standard; Interviewee 05, Low Threat), “dreadful” (Interviewee 11, High Threat), “terribly against” (Interviewee 24, High Efficacy) and “I know it’s wrong” (Interviewee 14, Standard) were used by individuals who had never smoked and those that were current smokers. These negative emotional reactions lead to participants trying to motivate others to quit and also, removing themselves from situations where another was smoking:

I’m really bad about the smoking... but I am always, telling people to stop smoking... I won’t allow smoking in the houses. (Interviewee 08, Standard)

I never smoked because I can’t even stand in the room if somebody is smoking, I have to move away from the bus stop I just eugh. (Interviewee 11, High Threat)

However, almost in contrast to such, interviewees expressed a large amount of sympathy and understanding for the difficulties associated with quitting smoking. Interviewees described quitting smoking as “the hardest thing in my life” (Interviewee 06, Low Efficacy), “very tough” (Interviewee 15, Low Efficacy), and “not easy” (Interviewee 18, Standard; Interviewee 02, High Efficacy), as well as a task that
required “focus” (Interviewee 02, High Efficacy) and “strong intention” (Interviewee 18, Standard). Others described the difficulties of being around someone who was trying to quit smoking:

*My wife, the Lord have mercy on her, she nearly killed me when I was, I was in such a vile mood.* (Interviewee 18, Standard)

*When they gave it up it was too late for them and eh then there was like divils [sic] and they’d be better off going back on it and give everyone else a bit of peace. I’ve seen people, as I said... and they’re like divils [sic] when they’re off them.* (Interviewee 21, High Threat).

In line with such, a number of interviewees made reference to being an “addict” (Interviewee 01, Standard), the effect of the “drug” (Interviewee 05 Low Threat), and the sympathy and understanding that went along with trying to break an addiction:

*Oh I’d say it would be difficult. I, I mean I’ve known plenty of people so... nicotine and eh I regard that as even more severely, more addictive; than maybe food.* (Interviewee 17, High Threat)

*It’s not that easy, sometimes the, the addiction is in the family genes, you know? It, life isn’t em, that easy and eh for people, I suppose there’s addictions in families as well.* (Interviewee 12, Overload)

This same level of sympathy and understanding was not offered to the other health behaviours.

### 6.3.3.6 Eating healthily

With eating healthily alone, common themes noted among the interviewees were references to eating healthily as a habit and discussions about eating healthily at a population level. One interviewee regularly referred to eating healthily as “habits” and the use of “routines” for such (Interviewee 02, High Efficacy). Interviewees
acknowledged both the positive and negative aspects of trying to consistently eat healthily and the impact of such a repetitive health behaviour when it was not carried out:

*I think that’s how the diabetes came on, cause I, this, I, I, I wasn’t a keeping an, an eye on it ya know? I had put on, on, on a lot of weight ya know and it was just incrementally over, over the years it just, it built up ya know?” (Interviewee 02, High Efficacy).

*It is easy to eat healthy to prevent, it can be quite, yeah, but we can have little bad habits too, like liking chocolate and stuff... I think it's all a balance.* (Interviewee 04, Overload)

Interviewees made references to an “overweight population” within Ireland, how it “seems to be acceptable now” and contributed such to bad eating habits (e.g., “fast foods…. getting take-aways, not cooking proper meals”) at a society level (Interviewee 09, Low Threat; Interviewee 16, High Efficacy). Additionally, one interviewee discussed how the Irish diet was leading to high CVD:

*I think the food – Irish diet over lifetime is eh, is not as – it has a lot of cholesterol in it and a lot of fatty stuff in it and we love it. There is probably no reason for anybody to eat themselves into heart disease by accident, but you can see it.* (Interviewee 08, Standard)

### 6.3.3.7 Physical activity

When discussing physical activity, a large proportion of interviewees discussed the positive aspects of taking part in regular exercise. These positive aspects related to physical health outcome and the influence of exercise on avoiding other detrimental behaviours that also improved physical health:
I joined a running club and it twas [sic] either smoke or run, and I took to the running, and it has improved my health immensely, that’s a good few years ago but I am still getting the benefits. (Interviewee 15, Low Efficacy)

I find walking is excellent actually for this and that I should walk every day because I feel better and I, eh, I definitely more healthy after walking. (Interviewee 19, Low Efficacy)

I have to admit it’s chairobics but it is still very, I know, my family came out madly to me when I said, “I’m joining the chairobics... It’s great, it’s terrific... Some of them have come in on sticks and so, helping them to walk.... some of them have had breaks and some of them have bad arthritis I mean you’d use every bit of, of your body... sitting down... you know, and all the joints that you need to exercise... and you do remember after you’ve done it, then maybe during the week when a bit of music comes on... join in, and so it’s really good. (Interviewee 24, High Efficacy)

As well as making reference to beneficial health outcomes, interviewees also described the positive impact on their mood, functionality and lifestyles due to regular exercise:

It’s great for yourself as well... your whole personality change... your whole outlook on life. You want to be strong you want to be able to go out and live life and do your thing that you want to do, look after grandchildren or you know, where if that was gone away from ya, you know, you’d feel terrible, disappointed in yourself cause it’s your own fault. (Interviewee 09, Low Threat)

I mean it does your mood and everything good, the endor. I know that the endorphins, the brain is a mood factor... It just brings you to life... It does me
good. Mentally and physically, and I feel better in meself [sic]. (Interviewee 12, Overload)

The same positivity was not expressed by interviewees in terms of giving up or refraining from smoking or for regularly eating healthily.

6.3.4 CVD associated factors

6.3.4.1 Summary

As discussed in other sections (e.g., 5.2.6 and 5.6.1), in general participants across both methodologies (quantitative and qualitative) reported a lack of message derogation and low negative emotional reactions (e.g., fear, anxiety and worry) in reaction to the EPPM-based CVD messages. As mentioned above the strongest emotional reactions were displayed as interviewees discussed their susceptibility and the severity of stroke (see section 6.3.1.5). What follows are the findings in terms of additionally CVD factors, not mentioned in the risk messages, that interviewees discussed in the process of ‘thinking aloud’ about CVD. Interviewees discussed the role of personality, stress and hereditary factors. These findings were deemed to be important due to the lack of information included about such within the EPPM-based CVD messages. The topics arose predominantly due to the interviewees themselves.

6.3.4.2 Personality dimensions

It should be noted that no information relating to personality dimensions that are linked with CVD were included in the EPPM-based CVD messages. However, two interviewees highlighted how they themselves were prone to anxiety and worry. Both references were made when participants were asked about their previous medical history. One interviewee used an example from a conversation with his wife to express his tendency towards worry:
I don’t think I’ve ever been diagnosed [laughs] with [depression], eh, with, with it ya know? But eh, but, but I know there’s, there’s an anxiety and there, there was, years but em… (Interviewee 02, High Efficacy)

I’m not an easy, I’m, I’m suffering at the moment, not all the time. I’m not a relaxed person… I remember saying to my dear wife, God love her, eh she never used bad language and I said to her about something we were doing, I said ah I’m fairly laidback. She said, you are in your arse. (Interviewee 01, Standard)

Additionally, other interviewees spoke in general terms about the types of personal dimensions that can lend themselves to an inflated risk of CVD (e.g., excessive worry, nervousness, exaggerated emotional responses), and the possible impacts of such:

Em, maybe if I wasn’t or maybe if I was a worrier, maybe if I felt, I should be doing more for my heart. (Interviewee 15, Low Efficacy)

If you were a nervous sort of, I think you’re, the sort of person you are, I mean, some people get frightened by anything. (Interviewee 16, High Efficacy)

Like I’ve known people that had those emotional and all the type of difficulties that are mentioned here. I don’t have them myself, I, I don’t have those reactions myself. (Interviewee 17, High Threat)

6.3.4.3 Stress

There was one line about coping and managing with stress within five of the six messages (exception was the low efficacy group). Yet it was found that interviewees discussed stress in relation to their own personal tendency, as a risk factor for CVD and methods for reducing stress. While reading the CVD messages, three interviewees made the following comments on their own personal tendency for stress:
Managing and coping with stress. Now I suppose I’m a bit, eh a bit, unrelaxed I know, ya know? (Interviewee 01, Standard)

I’m trying to cope with stress. (Interviewee 20, Low Threat)

Managing to cope with stress, em, I was never, I try too hard eh, to em, I try too hard to please… I’m the eldest of a family…. and eh, if you said “good girl” to me I’d do anything. I used to cope much better with stress than I do now, but then when all those kinds of things happen. (Interviewee 21, High Threat)

Additionally, while reading the information included in the CVD risk messages about the associated risk factors for CVD, two interviewees highlighted that stress needed to be included along with them. The interviewees emphasised the importance of stress along with other protective health behaviours:

I’m a hundred per cent on the stress side what your, how happy you are in your life and what’s going on in your life. I think if you get the other two right [diet and exercise] and you’re totally stressed, you’re not, so I believe about balance… It didn’t put in about people’s em, being unhappy in a marriage or being unhappy in a job or being stressed about their lifestyle. I think stress can actually be. (Interviewee 04, Overload)

Happiness too comes into it as well, you know, the less stressed you are I think the better. (Interviewee 12, Overload).

However, only one interviewee discussed the methods that they use for dealing with stress. The particular individual emphasised the success they personally had had with yoga for alleviating stressful thoughts and in turn, improving health:

Your mind wanders I find… if you’re stressed about anything, your mind goes back to that stress while you’re doing this stuff [exercise] that isn’t a challenge. Whereas with yoga, you have to concentrate… So all your stressful thoughts are
left at the door. As at, at the beginning of the class and it’s really so good for you and I’d say it’s good for my cardiovascular. (Interviewee 13, Low Efficacy)

6.3.4.4 Hereditary factors

While reading through the CVD messages, a number of interviewees mentioned hereditary factors for CVD. Interviewees highlighted how information relating to hereditary factors had not been included in the EPPM-based CVD messages:

*I think there is, um, something um, genetic about it as well.* (Interviewee 08, Standard)

*It’s just part of our lives, our family, we’re, not trying to absolve myself of responsibility but; at the same time it, it is there.* (Interviewee 17, High Threat)

*Em, are, are, are we missing the, the, is there, there, is there eh hereditary the, the, factor, factor in, in, in here, in relation to?* (Interviewee 02, High Efficacy)

Interviewees went on to discuss how these hereditary factors influenced their thoughts about CVD, their personal susceptibility due to such and the effectiveness of the associated health behaviours when there are hereditary influences as well:

*Well I suppose em, it prevents, it, keep it at bay maybe em, if it’s hereditary in the family as well... Having it in the family and that too em, it makes you [think about CVD].* (Interviewee 12, Overload)

*Apparently it can go on from generation to generation and it looks as if I’m the only one of my siblings who has a blood pressure thing, the others haven’t.* (Interviewee 13, Low Efficacy)

*Of course some of it, it’s not all that, it’s, it’s hereditary also... Omitting the fact that here-, of it being hereditary.* (Interviewee 23, Overload)

Interviewees’ discussion of the above topics should be taken into consideration along with the findings for health literacy, discussed in the following section.
6.3.5 Interview and health literacy

6.3.5.1 Summary

Themes related to health literacy and the interview process arose among interviewees. Although interviewees reported high levels of general knowledge about CVD, considerable inconsistencies were noted in their reporting of previous history of CVD and additionally, confusion over the measures included in the study. These results are in contrast to those discussed above where participants mentioned risk factors of CVD that had not been included in the CVD risk messages (see section 6.3.4 above).

6.3.5.2 Level, sources and impact of knowledge

A common theme noted throughout the majority of the interviewees was references made by interviewees to their general level of knowledge about CVD. When interviewees were asked about their emotional reactions to the CVD message and the items measuring message derogation, a large majority of the interviews responded in the negative (no emotional reactions and no message derogation). The most common justification given by interviewees (across all message groups) for such reactions was a statement about their already high knowledge of CVD and how the information presented in the messages was not new to them:

*I am well aware of cardiovascular disease. (Interviewee 19, Low Efficacy)*

*I know all about it. (Interviewee 21, High Threat)*

*Well I would be very aware of them, I already know them. (Interviewee 24, High Efficacy)*

*I know all this stuff already, I know this would make me healthier, I know this would make me better. (Interviewee 14, Standard)*

*I think I knew exactly what the cause was to it. Well I think I know—I know what prevent. (Interviewee 09, Low Threat)*
It doesn’t bother me, because I, I, I would have heard that. (Interviewee 11, High Threat)

It reinforced actually em, reinforced what I already, know. (Interviewee 12, Overload)

No it didn’t make me feel frightened, because I knew. I’d got to know all that. (Interviewee 13, Low Efficacy)

A high proportion of interviewees believed that they had a good general knowledge of CVD, to the point where a number of interviewees used words and phrases such as “obvious” (Interviewee 05, Low Threat; Interviewee 10, High Efficacy), “very practical simple thing” (Interviewee 21, High Threat), “true” (Interviewee 17, High Threat), “basically true” (Interviewee 10, High Efficacy), and “honest and truthful and the facts were there” (Interviewee 23, Overload). One interviewee went on further to state that:

Well, eh, you wouldn’t have to be eh a wrangling genius to see that. (Interviewee 06, Low Efficacy)

Interviewees however did not give specific examples for where they had acquired this high level of knowledge about CVD. Many made reference to “general knowledge” (Interviewee 01, Standard) or their own personal knowledge (e.g., “my knowledge”, Interviewee 13, Low Efficacy). A similar phrase was used twice by one interviewee, stating “I’ve always been led to believe…” (Interviewee 06, Low Efficacy), while another said “I don’t know why but we’re told it does” (Interviewee 23, Overload). No further details were given by the interviewees regarding where this level of knowledge had come from, and one interviewee equated it to “common sense” (Interviewee 05, Low Threat).
Three interviewees made reference to media platforms as their source of information and in particular highlighted the amount of health information on various media platforms:

*We hear so much on the radio and television about what we should be doing and about heart attacks and stroke.* (Interviewee 05, Low Threat)

*You’d want to be blind nowadays not to hear or see all the information there is on the telly, on the radio, or wherever, on the buses.* (Interviewee 16, High Efficacy)

*The things that are coming out in the media every day about it, about heart disease.* (Interviewee 19, Low Efficacy)

Similarly, three interviewees referred to medical professionals or forms of medical information and advice as their sources of information. Even with making reference to medical information, these interviewees expressed a certain level of uncertainty and possibly lack of confidence in the information:

*I really don’t know the reason why, I’m going on the... health advice.* (Interviewee 23, Overload)

*I have kind of look up medical books, well not medical books but I read, I read the things that are good and bad for you.* (Interviewee 09, Low Threat)

*We have great em doctors, because science has come on an awful lot as well, and there’s a great eh understanding and study being still done about em, you know stroke and heart and that we’re learning all the time... Well from the information that’s being given out by doctors and everything... Well you had all the statistics there. I’m sure em, youse do your research from doctors and hospitals and everything. They’re the, ones that give you all the, the information.* (Interviewee 12, Overload)
One particular interviewee referred to inconsistent CVD information being reported in media platforms:

*You read butter is bad for your heart now... and then next week you read it’s good for your heart... So how do you believe all these things? (Interviewee 10, High Efficacy)*

Additionally, two interviewees expressed the view that there was more information within media platforms and possibly the medical environment about cancer rather than CVD:

*When you see the statistics of how many people have died from, because all we’re scared about at the moment is cancer, when one in three people die from cancer, so we’re not aware as much in Ireland about the heart... You’re not aware, we would never think about that, be more cancer, cancer, cancer, cancer, and I think the doctors aren’t pushing the heart thing as much, I don’t think. The Irish medical, its more cancer... they should push a little bit more. (Interviewee 07, Overload)*

*There has been a lot in, in the news about lung cancer that and how it’s, quitting smoking is one of the major, I think, em, things that’s advocated in that regard. (Interviewee 19, Low Efficacy).*

Following on from such, interviewees did in places discuss the impact of information that was included in media platforms. However, it should be noted that some of these statements refer to health advice and others refer to advertising and marketing. Interviewees expressed a lack of impact and effectiveness in changing health behaviours, in particular smoking:

*I think now people have, couldn’t complain that, about the information being out there, it is there, if they choose to smoke, they’re going to smoke... and they*
know that it’s... they’re not doing it in, in, in the dark. (Interviewee 24, High Efficacy)

Difficult enough to do these because of all the advertising of all kinds of food... so much of it available at every corner of the street, eh, in all the shops, and the same with alcohol. Smoking, okay, thank goodness that has been, advertising cut back on that. Not sure of the results of it, though. (Interviewee 23, Overload)

When discussing the impact of health information for CVD interviewees did stress the importance of such:

I don’t think they, you can stress enough how important it is. (Interviewee 05, Low Threat)

I think the providing of information for cardiovascular patients is very important. (Interviewee 17, High Threat)

Coupled with the lack of negative emotional reactions to the CVD messages and the lack of message derogation, a couple of interviewees highlighted the positives of such information:

I think this is to help people. (Interviewee 03, High Threat)

I’m a great believer in all the information that is given out and I think it’s great. (Interviewee 15, Low Efficacy)

One interviewee discussed how the information is readily available and people will either listen to it or not. Beyond that, not much else could be done in the opinion of this interviewee:

If they’re are going to listen, they’ll listen, if they’re not, they’re not so. Nothing you can do about that... It’s only people themselves that just don’t want to accept it, that it could happen and they won’t listen to reason. (Interviewee 15, Low Efficacy)
6.3.5.3 Inconsistencies in reporting previous history of CVD

A contrast to the theme above about interviewees’ high levels of knowledge about CVD was the inconsistencies noted among a number of interviewees about their reporting of their previous history of CVD. At the start of the testing session, interviewees were asked a number of questions about their medical history, one of which was their own personal history of CVD. Two interviewees initially did not report a personal history of CVD; however, later in the testing session while discussing CVD it was revealed that both interviewees had experienced quite significant cardiac events and treatment. Yet these interviewees did not believe that these constituted a previous history of CVD:

Two angiograms and I think there was a fifty-five per cent blockage in one of the valves... I don’t, honest to god, like I could be wrong, I could drop dead tomorrow but I don’t feel anything wrong with my heart. (Interviewee 10, High Efficacy)

When I was twenty, one, I had em, my arteries were blocked in both legs and I had sympathectomises... that was do due with circulation of the legs. (Interviewee 12, Overload)

A number of other interviewees while discussing symptoms, medication, cardiac events and treatment for CVD raised questions with the interviewer on whether the particular event, symptom or medication would qualify them as having a history of CVD:

It was a slight heart attack two years ago. I had to get ehh, cart ehh, a stent put in my carotid artery. I suppose it was a kind of ehh, a heart attack, I’m not sure now. (Interviewee 05, Low Threat)
That's, doesn’t count as cardiovascular, does it?... I don’t think of them as health problems. [Stated in relation to high blood pressure and high cholesterol] (Interviewee 22, Low Threat)

I am on a heart tablet, but that doesn’t mean I have a cardiovascular disease, does it?”... I mean I wouldn’t call that a disease... mine is minor... Isn’t quite cardiovascular disease, is it? (Interviewee 24, High Efficacy)

The examples given above were not deemed to be obvious denial by interviewees. Along with the uncertainty and confusion discussed below with the measures used in the study and the further inconsistencies reported by other participants (see section 5.3.2) the inconsistencies were attributed to lapses in health literacy on the part of the interviewees.

6.3.6.4 Measures

A common theme among the interviewees was a lack of certainty and confusion about the measures used throughout the testing session. This was expressed by interviewees where they made a negative comment about the measure and asked questions about their validity:

It’s a strange question in the sense. (Interviewee 01, Standard; Stated in reference to smoking response efficacy)

It’s a peculiar question. (Interviewee 10, High Efficacy; Stated in reference to eating healthily response efficacy)

They’re very bland… It doesn’t connect with me… I’m trying to get it into...

These are trick questions aren’t they? (Interviewee 12, Overload)

Furthermore, a number of interviewees used phrases such as “I dunno how to answer this” (Interviewee 15, Low Efficacy), “I don’t know what to answer to that” (Interviewee 16, High Efficacy), “I’m not too sure, the way I’m answering that
question” (Interviewee 01, Standard), and “I’m confused a little bit by that” (Interviewee 24, High Efficacy) to express their ambiguity towards the measures and in their responses to such. Additionally, a large proportion of interviewees sought clarification and reassurance from the interviewer in giving their responses to measures based on previous medical history, threat perceptions, and efficacy perceptions:

*How do you mean works? Prevents? Works? (Interviewee 01, Standard)*

*So what would you put down for that? (Interviewee 09, Low Threat)*

*So what, what goes there? (Interviewee 13, Low Efficacy)*

*Please explain, em, what do I put down there? [Stated in relation to personal previous history of CVD]… Do you have any other on-going health problems? (Interviewee 14, Standard)*

*So where, where, where do I, where do I…? (Interviewee 18, Standard)*

*I don’t know, what number would I put down? (Interviewee 21, High Threat)*

### 6.4 Discussion

#### 6.4.1 Summary of findings

#### 6.4.1.1 EPPM

As with study two and part one of study three, no direct evidence from the think aloud methodology and the subsequent qualitative analysis was found to support the EPPM. Throughout the thematic analysis, it was noted that the findings were occurring across all six EPPM-based message groups, and it was not possible to distinguish any notable differences for threat, efficacy and message derogation. As discussed in section 6.3.1, there was a small amount of danger- and fear-control processes displayed by a couple of interviewees. These findings arose from interviewees in all six message groups and given the low level of such did not highlight an impact of one particular EPPM-based message. The key findings discussed in the following sections were
consistently found across all message groups and no patterns in favour of one group over another emerged.

6.4.1.2 Threat

From a qualitative perspective unlike in the quantitative analysis, a number of key findings were noted for threat appraisals. A consistent finding throughout was the use of comparative examples by interviewees when discussing their CVD threat appraisals. It appeared from the qualitative data that this was due to a generally high susceptibility for any disease among the older population due to aging. An important finding for the communication of CVD was the stark differences in threat appraisals for different CVD manifestations among interviewees. The implications of such are discussed below in section 6.4.2.1.

6.4.1.3 Efficacy

Similar to the findings above for threat appraisals, interviewees consistently utilised comparative examples when discussing the effectiveness of all three health behaviours. Furthermore, for eating healthily interviewees made a number of references to general diet trends and the levels of obesity at a population level within Ireland. When discussing all three CVD associated health behaviours (e.g., smoking, eating healthily, physical activity), the combined effectiveness of all health behaviours was a prominent consideration among interviewees’ efficacy perceptions. Interviewees did highlight the need for motivation in carrying out each health behaviour and even more so, when the health behaviours are habitual ones such as refraining from smoking, eating a healthy diet and exercising regularly. When discussing the health behaviours individually, it was noted that interviewees did consider a number of emotional aspects.
6.4.1.4 Health literacy

A number of issues relating to health literacy were noted among the findings. Interviewees consistently and confidently stated that they had a high general knowledge of CVD and the associated health behaviours. Furthermore, throughout the process of interviews topics related to CVD (e.g., hereditary factors, personality dimensions, stress) that had not been covered or not strongly emphasised within the messages were discussed by interviewees. In contrast, a large number of inconsistencies were found in the reporting of personal history of CVD and a lack of specification for where interviewees had gained such high levels of CVD knowledge. Furthermore, it was found that interviewees regularly sought clarification and assistance from the interviewer when answering questions about CVD threat and efficacy perceptions based on the RBD scale.

6.4.1.5 Conclusions

Similar to part one of study three, the findings of part two did not display any notable differences between the six EPPM-based CVD messages. Findings were consistent across message groups, and highlighted general concerns for the use of the EPPM and other decision-making theories for communicating health risks. Separate communications for different CVD manifestations, the role of comparative threat and efficacy perceptions, and greater consideration of misleading levels of health literacy are discussed below as important theoretical and practical implications following the findings of the current qualitative analysis.

6.4.2 Theoretical implications

6.4.2.1 Threat appraisals

In general, interviewees reported high threat appraisals for CVD. This was reflected in the qualitative data and is in contrast to the findings of Nolan and
colleagues (2015) wherein diabetic patients expressed little concern about having a heart attack or stroke after going through an online CVD risk calculator. However, the most noteworthy findings from the current investigations were the stark difference between interviewees’ threat appraisals for stroke in comparison to other CVD manifestations, in particular heart disease and MIs. One could consider the advances in medical treatment for MI in particular. Currently fewer individuals die from an MI than in the past, and their levels of functionality following an MI have improved (Petrie, Cameron, Ellis, Buick, & Weinman, 2002). However, the same cannot be said for outcomes following a stroke. One previous study did examine the use of the EPPM for increasing stroke awareness and knowledge in both a young and old population (Davis et al., 2009); however, the main outcome of the study was stroke knowledge and no measures of threat appraisal based on the EPPM or any form of stroke risk perception where measured.

Similar to that mentioned above, other examples from previous research can be found investigating levels of stroke awareness and knowledge, and perceptions of risk or threat for stroke (Christian, Rosamond, White, & Mosca, 2007; Ferris, Robertson, Fabunmi, & Mosca, 2005; Kraywinkel, Heidrich, Heuschmann, Wagner, & Berger, 2007; Mosca et al., 2000; Pancioli et al., 1998; Parahoo et al., 2003). The results from such studies are inconsistent, with reports of both high and low levels at specific time points, as well as increasing and decreasing across time periods following intervention, for knowledge, awareness and threat perceptions of stroke. Christian et al. (2007) contributed the varying results to confusion over media reports of the effectiveness and impact of various health behaviours and risk (e.g., diet, weight, stress/depression). Lack of information provision to certain racial/ethnic groups, age and levels of communication between patients and healthcare providers have also been suggested as
influencing factors for such (Ferris et al., 2005; Mosca et al., 2000). One example from an Irish cohort showed the effectiveness of a single stroke education session in improving stroke knowledge and awareness among middle aged (40+ years) dwellers of a semi-rural community (O'Callaghan, Murphy, Loane, Farrelly, & Horgan, 2012). In slight contrast to the current study, the authors highlighted the poor levels of knowledge about stroke and the warning signs among participants before the education session.

The current study did not measure stroke knowledge and awareness; however, from the qualitative data participants consistently expressed high threat perceptions for stroke predominantly based on comparative examples from family and friends, which could suggest high levels of awareness for the disease. The differences in location between the two studies should be noted (see section 5.6.4 for further details). Lambert, Vinson, Shofer, and Brice (2013) noted how individuals at higher levels of risk for CVD reported higher levels of stroke knowledge. Participants were assigned to a low, moderate and high risk of CVD utilising a risk assessment tool, and their knowledge for MI and stroke were measured. Although stroke knowledge did increase as participant’s risk of CVD increased, it was also found that participants’ knowledge of stroke was consistently lower than their knowledge of MI (Lambert et al., 2013).

There are relatively few studies examining the differences in threat perceptions between different CVD manifestations, and none that have utilised the EPPM. Furthermore, a large amount of previous research, this study included, have asked individuals to report their perceptions, knowledge and/or awareness of CVD as a whole or with the phrase ‘heart attack/disease or stroke’ (Gans, Assmann, Sallar, & Lasater, 1999; Mosca et al., 2000; Scarborough, Morgan, Webster, & Rayner, 2011; Weinstein, 1998). The findings from the current study would suggest that such a combination is not appropriate, as older Irish adults seem to display considerably different threat
perceptions for stroke versus other CVD manifestations. Such differences underlying the threat appraisals could have reduced the effectiveness of the CVD risk communication (Kreuter & Strecher, 1995) and in turn impacted the effect on behavioural intentions for the associated health behaviours. Any future investigations into such should take note of the strong, negative emotional reactions displayed by participants in the current study to stroke and the possible health and functionality outcomes from such. High levels of fear in reaction to stroke communications could result in defensive reactions, message derogation and fear-control processes (Witte, 1992, 1998; Witte & Allen, 2000; Witte et al., 2001).

6.4.2.2 Efficacy

Interviewees heavily questioned the effectiveness of individual health behaviours and made reference to the collective effect of all associated health behaviours for preventing and deterring CVD. When participants did consider the relevant health behaviours individually, a number of different influencing factors and emotional reactions were displayed across the three (e.g., strong dislike for smoking, inconsistency in maintaining a healthy diet and the positive effects of exercise for mood and physical health). As discussed in section 4.1.2.1 the body of literature utilising the EPPM and fear appeals in general for reducing smoking has produced mixed results (Gharlipour et al., 2015; Wong & Cappella, 2009; Wright et al., 2006). Although participants in the current investigations displayed strong negative emotional reactions to smoking, these reactions did not appear to impact on participants’ likelihood to partake in danger- or fear-control processes for such. In contrast, participants regularly discussed the positive and beneficial aspects of physical activity for both emotional and health outcomes. Similar to the finding for smoking though, the positive reactions to such did not appear to impact on danger-control processes, in particular.
Previous research has found the EPPM to be effective for impacting on behavioural intentions for physical activity (Bassett-Gunter et al., 2014; Hatchell et al., 2013; Richards & Johnson, 2014), similar to the results outlined from part one of the current study (see section 5.3.3.4). It is still unclear which exact processes can be attributed to improving intentions. Hatchell et al. (2013) did not investigate the impact of efficacy, only varying levels of threat information, and utilised repetition in their procedure. Bassett-Gunter et al. (2014) found evidence to support the importance of fear among a sample of individuals with a family history of inactivity-related disease, and therefore personal relevance may have played a role in their results. The current study included information on a number of health behaviours within the EPPM-based CVD message and did not quantitatively assess positive and negative reactions to such. Therefore it is difficult to make confident conclusions about the possible influencing effects on CVD associated health behaviours. Future research may benefit from examining the possible mediating role of positive and negative reactions to health behaviours for participants’ future behavioural intentions.

6.4.2.3 Social factors

A key finding from the qualitative data within the current study was the large number of comparative examples used by participants when discussing their threat and efficacy perceptions for CVD and the associated health behaviours. Such results raise considerable questions for the EPPM given that the model contains little information relating to the possible effects of comparative perceptions and other social factors in influencing health threat and efficacy appraisals. Given that the quantitative results of study two and part one of study three found that participants consistently had higher comparative CVD susceptibility perceptions than personal ones, an in-depth discussion of social factors for the EPPM, general health decision-making and risk is presented in
Results and findings from both study two and three will be taken into account for such.

6.4.3 Practical implications

For practical implications, there are a number of points from the theoretical implications outlined above and those highlighted in section 5.4.2 for part one that could also be considered relevant for future communications (e.g., different threat appraisals for various CVD manifestations, use of comparative examples for threat and efficacy appraisals, effectiveness of the health behaviours as a group rather than individually). Additionally, the findings of the current analysis raised a number of questions about the rates of health literacy among the older sample. From both the quantitative and qualitative data, there were inconsistencies noted in participants’ reporting of their previous history of CVD. Furthermore, a consistent finding from the qualitative data was the uncertainty and confusion among participants when utilising the RBD scale to give their perceptions of threat, efficacy and reactions to the health messages; these findings are similar to those of Bonner et al. (2014), Nolan et al. (2015) and Luger et al. (2014) in their think aloud assessments of online CVD risk calculators and diagnosis tools.

In two or three instances, participants did make reference to CVD as more common for men than women, or that women would generally be more worried about other diseases and health concerns (e.g., cancer, arthritis, falls) than CVD. However, it was not a key finding within the qualitative data suggesting that the stereotype of CVD as a masculine disease may not be as prominent as previously thought. The finding is encouraging given that CVD is currently more common among older European women than men (Nichols et al., 2012). Participants also made a couple of references to higher susceptibility levels for cancer rather than CVD and furthermore, that they believed
there is more information provided about cancer than CVD in both medical and media environments.

Previous research does suggest that threat perceptions for cancer are greater than those for CVD and coupled with the body of literature examining the low rates of health literacy for CVD (Gans et al., 1999; Lambert et al., 2013; Mosca et al., 2000; O'Callaghan et al., 2012; Webster & Heeley, 2010), one of the key practical aims for any future communications needs to be increasing the level of accurate awareness and perceptions for CVD and the associated health behaviours among various populations. In their assessment of the EPPM- and HBM-based psychosocial barriers and facilitators for colorectal cancer screening, Leung et al. (2016) found that knowledge barriers (from the HBM) were significantly related to older individuals’ participation of such in the past. See chapter seven for a further discussion of the implications of the health literacy results and findings from study two and three.

6.4.4 Limitations

See section 5.4.3 for a number of relevant limitations. It should be noted that think aloud methodologies are dependent on participants verbalising their conscious thoughts. If participants choose not to do so or if the thought process is an unconscious one, then the information will not be collected. Additionally, such procedures can be impacted by the presence of the interviewer.

6.4.5 Conclusions and future research

The findings from the current investigation highlighted a number of important considerations for future research. Future communications may benefit from focusing one particular CVD manifestation, rather than the disease group as a whole. Additionally, among the older population, threat appraisals for specific illness can be affected by general susceptibility due to aging. For the EPPM and other theories of health risk and
decision-making, the impact of comparative risk and social examples for individual threat and efficacy perceptions needs to be counted. These findings, along with the highlighted issues for CVD health literacy, can be applied to future, tailored risk communications for CVD and the associated health behaviours.
Chapter 7: General Discussion

As highlighted in chapter two, there is a considerable lack of research examining dual information processing of health communications for CVD risk. The overall aim of this thesis was to add to this body of literature by presenting an in-depth theoretically-derived examination utilising mixed method approaches (e.g., integral and incidental manipulations, quantitative and qualitative assessments). The thesis evolved into an examination of the theoretical framework of the EPPM for communicating about CVD threat and efficacy appraisals for the associated health behaviours (e.g., smoking, eating healthily, physical activity). Therefore, the thesis provides a significant contribution to the EPPM literature, as, to the author’s knowledge, these are the first studies to produce experimental manipulations of both threat and efficacy information for CVD and the associated health behaviours. As stated in section 2.4, no other previous research has examined incidental and integral manipulations for dual information processing for CVD risk communications. Furthermore, no previous studies have varied the levels of threat and efficacy information included in CVD risk communications. Therefore, the studies have helped identify aspects that potentially should and should not be included in future communications. Additionally, the findings add greatly to the body of literature about “how” both information processing modes from the EPPM impact on CVD threat and efficacy appraisals.

As the results of study one suggested that the EPPM would provide a better theoretical background for future studies than Slovic’s risk-as-analysis versus risk-as-feelings theory (Slovic et al., 2004; Slovic & Peters, 2006; Slovic et al., 2005), the two main studies (two and three) included in this thesis were based on testing the propositions of the EPPM. Therefore, what follows below is a discussion of the theoretical and practical implications for the EPPM given the results and findings of
this thesis. For specific implications for study one, see section 3.6. An overall summary of the research from previous chapters will be presented first. The implications of these results and findings will be highlighted and suggestions will be made for future research. Lastly, the general limitations of the current investigations will be noted.

7.1 Summary of Research

Chapter two presented a narrative review of the most relevant literature from dual process theories of risk, judgement and decision-making. Due to a large body of literature on these theories from a cognitive and social cognitive perspective, a section discussing the most relevant theories for this thesis was presented. A consideration of dual process theories for risk perception was also included. One of the main outcomes of the review was the lack of consideration given by a number of dual process theories to the role of affect. The review focused on presenting the applications of dual process theories to health behaviours and outcomes; however, the body of literature on these issues was considerably smaller than that examining financial and gambling risks and outcomes. From a health perspective, it was noted that there were fewer examinations conducted on CVD risks in comparison to other diseases. An equal examination of dual information processing for CVD risks and the associated health behaviours within risk communications became the focus of the following research studies. It should be noted that due to the results of study one, there was a change in theoretical focus from the risk-as-analysis versus risk-as-feelings (Slovic et al., 2004; Slovic & Peters, 2006; Slovic et al., 2005) to the EPPM (Witte, 1992, 1998; Witte & Allen, 2000). A review of the EPPM was presented in the introduction to chapter four.

Chapter three examined how cognitive and affective-based information processing modes influence CVD risk perception through the use of an incidental manipulation. The study aimed to utilise a combined manipulation of images and a
word search puzzle to prime a positive-affective, negative-affective or cognitive salient information processing mode, and examine the potential impact of such on CVD risk perception. The results of the study did not support the use of such for impacting cognitive and affective information processing and CVD risk perception. Differences were found in the immediate outcomes of the information processing manipulation; however, these did not carry over into the measures of dual information processing and CVD risk perceptions. Additional statistical analyses were conducted in order to aid with understanding and give further insight into the underlying theoretical structure of the data. Results of the factor analysis suggested a slight theoretical shift for the studies conducted in chapters four and five. The findings suggested that a dual information processing theory based specifically on health communications and utilising an integral manipulation, rather than an incidental one, would be more appropriate for future studies. Although no evidence was found to support the original hypotheses of chapter three, the study did present a novel approach to examining dual information processing for a health risk where investigations of such a nature are lacking.

Initially, chapter four presented a review of the EPPM and the most relevant literature for CVD threat and the associated health behaviours. Similar to the review presented in chapter two, it was found that there was a lack of research examining the EPPM in relation to CVD. The body of literature on the EPPM is not as extensive as that of other dual process theories that have been applied to health risks and outcomes. Therefore, the objective of study two was an experimental test of EPPM-based risk communications about CVD and the associated health behaviours. From study one to two, a change occurred from incidental manipulation to integral, where the level of threat and efficacy information within the health communications was varied to examine the effect on CVD threat appraisals and efficacy appraisals for three of the
main associated health behaviours (e.g., smoking, eating healthily, physical activity). Given the lack of overall effects from the EPPM-based CVD messages and the inconsistent results for threat, study two provided little evidence to support the use of the EPPM for communicating risks of CVD and efficacy information about the associated health behaviours. Given such, future investigations aimed to conduct a more focused experimental examination of the levels of threat and efficacy information included in the CVD risk messages in order to elucidate possible differences between variances in the amount of threat and efficacy information.

Chapters five and six discussed the mixed method approach of study three, with the quantitative aspect presented in chapter five and the qualitative investigation in chapter six. Part one of study three presented an examination of six EPPM-based threat-to-efficacy ratios in health messages about CVD and the associated health behaviours among older adults (60+ years). Given the low reported rates of personal and family history of CVD in the study two from the younger population, study three focused on individuals over the age of 60 years given the higher rates of CVD and the increased burden of such for this population. Quantitatively, part one of the study provided no evidence to support the use of the EPPM for communicating risks of CVD and efficacy information about the associated health behaviours among older individuals. Efficacy was noted as playing a role for short-term behavioural intentions for physical activity among the older population (60+ years).

Due to the lack of previous qualitative research into the EPPM and the lack of evidence to support the EPPM from studies two and three, a think aloud methodology was used in part two of study three, in order to allow for a more in-depth investigation into the findings relating to the information processes employed by participants when assessing the risk communications and completing the relevant measures of threat and
efficacy following such. The methods and findings were presented in chapter six. The qualitative findings highlighted a number of important considerations for future research specifically in terms of the EPPM and more generally, for health decision-making theories. In particular, the varying threat appraisals for different CVD manifestations among participants, high levels of susceptibility due to general aging among the population, and the considerable role of social examples and comparative perceptions for both threat and efficacy appraisals were found to impact on the effectiveness of the current EPPM-based CVD risk communications.

7.2 Implications and Future Research

7.2.1 EPPM

As discussed throughout section 4.4, 5.6 and above, overall the current thesis did not find evidence to support the EPPM in health communications about CVD and the associated health behaviours. Specifics relating to possible reasoning for such and the implications for each study are discussed in their relevant discussions. In spite of this, the current research has raised a number of topics that are relevant for the EPPM and other risk and decision making theories when examining health risks and associated behaviours. A key strength to the current thesis, in particular for study three, was the inclusion of a think aloud approach which allowed a novel and rigorous qualitative analysis to be conducted on the topic. What follows below are the implications and suggestions for future research based on the results and findings of the current thesis.

7.2.1.1 Measurement of threat

With regards to the inconsistent and lack of results found for danger and fear-control processes within study two and three, it should be noted that measuring risk perceptions can be difficult and impacted by a number of potentially confounding variables (e.g., optimistic bias, lack of definition of the topic, perceived levels of
controllability, prior behaviour; Sjöberg et al., 2004; van der Velde et al., 1991; Weinstein & Nicolich, 1993; Weinstein, Rothman, & Nicolich, 1998). French and Marteau (2008) highlighted how different measures of risk perceptions can result in varying findings for risk perceptions and affective responses. The authors called for the use of theory-lead measurements. For many disciplines there is no set scale that is utilised for measuring risk perceptions, instead a common set of risk dimensions that researchers are expected to include, which are often referred to with different terminology (e.g., susceptibility or vulnerability, severity of the threat/hazard, personal versus comparative perceptions; Brewer, Weinstein, Cuite, & Herrington, 2004; Janssen et al., 2011; van der Velde, Hooykaas, & van der Pligt, 1996). Furthermore, previous investigations have shown that risk perceptions can vary depending on the domain in which they are being measured (Johnson et al., 2004; Weber et al., 2002; Weber & Milliman, 1997).

The EPPM does attempt to deal with this by measuring threat and efficacy appraisals separately. Even if the disease and health behaviour are related, that does not necessarily mean that participants will view a connection between their threat perception for that particular disease and the efficacy appraisal of the related health behaviour. Millar and Millar (1993) presented the results of two studies that demonstrated that cognitive and affective reactions to different types of health behaviours can be different, with disease detection behaviours more associated with affective responses than cognitive ones. Consideration of the possible variances between different measures of risk is not as great within health risk as compared to other bodies of literature examining other risks (e.g., financial, driving behaviour) and there are few rigorous assessments of such within health domains (Grable & Lytton, 1999; Harrison, Young, Butow, Salkeld, & Solomon, 2005; Sundström, 2008, 2011).
Those that have been conducted are specific for particular health risks (e.g., cancer and vaccination behaviours) and therefore, caution should be taken with generalisation of results (Brewer et al., 2007; Janssen et al., 2011). The EPPM and the associated RBD scales are posited as a theory and measure for examining health communications and the reactions to such; however, it is a relatively new theory in comparison to others. As discussed throughout chapter two the body of literature on health risks is minute in comparison to other types of risks, and the effects of such can be seen in the variety of measures used by researchers when assessing health risks.

Given the findings of the current research outlined above, future research may benefit from focusing on assessing specific disease, rather than classes of diseases. Given the difference observed between stroke and other CVD manifestations, it would be interesting to see if EPPM-based stroke communications would be more effective than the current CVD ones. As mentioned a number of times throughout this thesis responses to different disease and health behaviours can vary (Lawton et al., 2009; Millar & Millar, 1993). The current studies (particularly, studies two and three) can be replicated for other diseases (e.g., specific cancer manifestations, diabetes, etc.) to assess if the EPPM would be more effective for communicating about these diseases in comparison to CVD.

### 7.2.1.2 Emotional regulation

For the older population sampled in study three, slight differences were noted between the message groups in terms of their quantitative negative emotional reactions (e.g., fear, anxiety, worry). However, overall participants reported low to no negative emotional reactions to the CVD messages. The EPPM (Witte, 1992; Witte & Allen, 2000; Witte et al., 2001) emphasises that in order for a health communication to be effective, and to cause the individual to enter either danger- or fear-control processes,
there must be a certain level of threat or fear experienced by the individual. There is a lack of definition for this “certain level” of threat. As mentioned in section 5.1, there is a body of research to support increased levels of emotional regulation by older adults (Carstensen, Isaacowitz, & Charles, 1999; Charles & Carstensen, 2010; Scheibe & Carstensen, 2010). Although the current study did not include measures of positive emotional reactions as the scale was based on the EPPM, the findings for the quantitative negative emotional measures are in line with those of increased emotional regulation among older individuals.

Consideration should be paid to the inconsistencies among findings for such among the qualitative data. As mentioned several times when discussing their threat appraisals and negative emotional reactions to CVD, marked differences were noted by participants between perceptions for stroke and other CVD manifestations. From the qualitative findings, it did appear that participants’ negative emotional reactions were related to their threat appraisals for stroke. The finding is in line with that of Carcioppolo et al. (2013) who found that fear mediated the relationship between threat appraisals for cancer and young females HPV vaccine intentions. Although the findings are against the general idea of increased emotional regulation by older adults, it should be noted that participants also appeared to be basing their negative reactions and threat appraisals around comparative examples taken from family and friends who had experienced a stroke.

In two in-depth reviews of social and emotional aging among older adults, Charles and Carstensen (2010) and Lockenhoff and Carstensen (2004) discuss how increases in emotional regulation are linked to aspects from the social environment and social connections. Along with more experiences and the perception of limited time, older adults have smaller but more established and potentially stronger, social
connections, which in turn can result in experiencing negative emotions less and a stronger sense of meaning in terms of family and friends (Charles & Carstensen, 2010; Lockenhoff & Carstensen, 2004). For study three in this thesis, participants were drawing on comparative examples of family and friends; however, they were describing the negative outcomes of stroke for such individuals and their emotional reactions in terms of the difficulties and hardships experienced after a stroke by all involved.

Although participants in this study displayed negative reactions to stroke, these did not result in participants’ partaking in fear-control processes. Future research may consider examining EPPM-based communications in terms of the specific domain of stroke and its consequences for older individuals in terms of their emotional regulation. Quantitative evidence, along with more qualitative findings, would be required for any following investigations. The stark difference between threat appraisals for stroke versus other CVD manifestations was quite a novel finding from the current research. Given the lack of evidence within the current research to support the EPPM, the SRMI (Diefenbach & Leventhal, 1996; Leventhal et al., 1992) may serve as a more appropriate model for future investigations into the role of negative emotional reactions for stroke on threat appraisals. The SRMI posits that negative emotions, such as fear, can work in parallel to cognitive processing, impacting the threat appraisal. From the think aloud piece included in study three, it appeared that participants’ fear of the negative, debilitating and often long-lasting effects of stroke caused greater threat appraisals of it versus other CVD manifestations (e.g., heart attacks, cardiac surgery).

7.2.1.3 Health behaviours and relevant analyses

The role of efficacy for older adults was highlighted by study three as an important consideration for eating healthily, and in particular physical activity. However, no such results were found within study two. When generalising from such
results attention should be paid to the number of health behaviours included in the CVD risk messages and the populations sampled (see section 5.6.2.2 and 6.3 respectively). Additionally, the types of analyses used for study two and three should be taken into account. Given the design of both studies, analyses were predominantly completed through ANOVAs given their robust nature, the sample sizes of both studies and the mostly even group sizes (Donaldson, 1968; Field, 2013; Wilcox, 2012). In their examination of EPPM threat-to-efficacy ratios, Carcioppolo and colleagues (2013) utilised hierarchical multiple regression with mediation in order to give greater insight into the possible associations between the different messages and the relationships with potentially influencing variables of fear, severity, susceptibility, self-efficacy and response efficacy. Given the design of study three and in order to conduct a precise examination of the potential differences between groups and the potential role of threat and efficacy, the author deemed hierarchical multiple regressions with moderation to be more appropriate. This analysis was chosen as it allowed comparison of the EPPM threat-to-efficacy message groups, while still considering the “real-world” relationships between the groups and the influencing variables of threat, efficacy and behavioural intentions (Field, 2013).

7.2.2 Social influences

As discussed in chapter two, there are a large number of dual processing theories for judgment and decision-making arising from a social-cognitive perspective. Although there are differences between the theories, the broad idea behind all is to aid in the understanding of the cognitive abilities we use in order to understand and interact with one another (Spunt, 2015). For health, this means greater consideration of the interactions between social influences and both dual processing modes (affective and cognitive), and the impact of such interactions on health outcomes (e.g., health threat
perceptions, health behaviours, and biomedical outcomes). As discussed in section 1.1.2.1, greater consideration is being paid to the role of psychological and emotional risk factors for CVD and other health outcomes. Rozanski (2014) highlighted the risk of social isolation and poor social support for CHB behavioural risk factors. Furthermore, the author along with other researchers have argued that the individual’s cognitive perspective (e.g., risk perception, thoughts towards a sense of purpose) of their risk factors can influence their behavioural activities (e.g., physical activity, diet, smoking, etc.) and in turn, their short and long-term biomedical measures (Graves & Miller, 2003; Millar & Millar, 1993; Rozanki et al., 2005).

A similar connection between affective and cognitive processes and health outcomes can be seen across a number of the dual processes theories (e.g., SRMI, EPPM). The SRMI posits that when presented with a health threat individuals will partake in parallel processing on both cognitive and emotional levels (Diefenbach & Leventhal, 1996; Leventhal et al., 1992). The illness perceptions of identity, timeline, causality, controllability and consequences that an individual constructs after being faced with a health threat, along with their emotional relations, will influence their coping behaviours (e.g., seeking medical care, screening behaviours, partaking in health behaviours; Cameron, Leventhal, & Leventhal, 1993; Lau, Bernard, & Hartman, 1989; Marteau & Johnston, 1986). As discussed throughout chapter four, a core construct of the EPPM is threat (Witte, 1992; 1994), and how perceptions of susceptibility and severity of the health threat in reaction to health communications can influence whether the individual partakes in danger- or fear-control coping processes (e.g., consciously thinking about the threat, processing active ways to deal with the threat, denial, perceived manipulation by the health message; Witte et al., 1996). What follows below is a discussion around how the findings of this thesis may inform future discussions and
further research around the impact of social factors for the EPPM and the body of socio-cognitive dual processing theories.

### 7.2.2.1 Social-cognitive theories

Numerous examples can be found throughout the literature where dual process theories from a social-cognitive perspective (e.g., CEST, SRMI) have been applied to health risks, health behaviours and diseases, with mixed results (Browning et al., 2009; Dhaliwal, 2011; Hagger & Orbell, 2003; Millar & Millar, 1993; Norman, 2009). As mentioned in section 2.1.1.2, some researchers have criticised the vast number of such theories (Kruglanski & Gigerenzer, 2011), and questioned the effectiveness of results given the differences between such theories in terms of the level of consideration given to affect, the nature of the connection between affective and cognitive processes, and which environmental cue is seen to influence outcomes (Evans, 2008; Haidt, 2001; Kruglanski & Gigerenzer, 2011; Slovic et al., 2005; Wang, 2006). The body of literature examining the antecedent factors and processes that can influence health-related behaviours includes approaches from a variety of theoretical perspectives, such as social cognition models, ecological and behaviour change (Conner & Norman, 2005; Johnston, 2005; Orbell, 2004). In a review of social cognitive theories for explaining physical activity, Young and colleagues (2014) argued that health psychologists have a tendency to overly focus on cognitive variables, and have not given adequate consideration to socio-structural factors (e.g., positive cues from the environment and establishing social relationships with likeminded individuals as mechanisms for initiating and maintaining health behaviours).

A couple of examples were discussed in section 5.4.1.2 where researchers included elements of social threats or trust into their examinations of the EPPM for health communications (Prati et al., 2012; Smith et al., 2007). However, as previously
noted this was done due to the confounding effects of such on the particular health threat under investigation. Similar examples can be found among behaviour change theories from a health perspective, where various elements of social influence have been added to an investigation of a particular health risk or outcome in order to better understanding the influencing role of such (Albarracin, Kumkale, & Johnson, 2004; Durantini, Albarracin, Mitchell, Earl, & Gillette, 2006; Rus & Cameron, 2016; Scaglione et al., 2015). Albarracin and colleagues (2004) and Durantini and colleagues (2006) both presented meta-analyses of the impact of social agents and power for condom use and HIV-prevention strategies respectively. Scaglione et al. (2015) highlighted the role of contextual protective behaviours among students’ alcohol-related sexual risk behaviours in a dual-process decision-making model. They found that intentions and willingness to use contextual protective behaviours were significantly related to increased use of such and in turn, less alcohol-related sexual risks.

In spite of these examples from previous research and the results of meta-analyses, still not all the health dual-processing or behaviour change theories consider the possible role and impact of social influences. As previously mentioned, the EPPM lacks such, as does the HBM. For those that do, there is a lack of consistency across the theories in terms of their theoretical assumptions, which social influence they pay attention to, in the terminology used to describe such, and in their measurement techniques (Tyson, Covey, & Rosenthal, 2014). The TPB (Ajzen, 1991) considers the impact of subjective norms on health behaviours. Within the social cognitive theory, Bandura (Bandura, 1986, 1997) argues that one of the three main classes for outcome expectations for behaviours are social ones, and in particular the anticipated approval or disapproval of an important other. In general across the body of literature examining various risk, little attention has been paid to the impact of social factors for health risks,
particularly when compared to other risks such as flooding, gambling and radiation (Kellens, Terpstra, & De Maeyer, 2013; Kim, 2016; Spurrier & Blaszcynski, 2014).

Focusing on CVD-related health behaviours, a large number of authors have displayed the effects of social norms and peer pressure on risky health behaviours among young individuals (e.g., smoking, alcohol consumption; Reyna & Farley, 2006), while others have focused on how influences from environments and the social context can impact on diet and physical activity (Ershow, 2009; Molloy, Dixon, Hamer, & Sniehotta, 2010; Petosa, Hortz, Cardina, & Suminski, 2005). In one specific review of 23 studies examining psychosocial determinants of fruit and vegetable intake, beliefs about perceived social influences were found to explain intentions for fruit and vegetable consumption among adults (Guillaumie, Godin, & Vézina-Im, 2010). Furthermore in a similar review, Shaikh, Yaroch, Nebeling, Yeh, and Resnicow (2008) found that social support, along with self-efficacy and knowledge, was a stronger predictor of fruit and vegetable consumption when compared to perceived barriers, intentions and attitudes. Despite the significant findings, both reviews highlighted the low number of studies that had measured social factors and considerable differences across theories in terms of which social factors they chose to examine (Guillaumie et al., 2010; Shaikh et al., 2008).

Reviews examining influencing factors on physical activity have identified a number of social and environmental variables that can play a role, such as lack of social support, lack of access to facilities and services, and bad weather (Dunn et al., 1997). Both perceived and objectively determined aspects of the individual’s environment have been found to affect levels of physical activity (Humpel, Owen, Iverson, Leslie, & Bauman, 2004; Owen, Humpel, Leslie, Bauman, & Sallis, 2004). Physical aspects of the environment, such as availability of sidewalks, parks and trails, parking, and
proximity to coastal locations, as well as a ratings of pleasantness, attractiveness and convenience, when rated high were all found to increase likelihood of walking among adults (Ball, Bauman, Leslie, & Owen, 2001; Craig, Brownson, Cragg, & Dunn, 2002; Humpel et al., 2004). Given such results, recognition of the role of such environmental factors is growing among intervention and policy developers (Nelson, Wright, Lowry, & Mutrie, 2008). To the point where Reyna and Farley (2006) in their article argued for the role of social heuristics in decision making.

Comprised of social norms (“beliefs about what the majority does”; Reyna & Farley, 2006) and perceived social benefits from peers, these social heuristics can execute a large influence over adolescent decision making in terms of smoking, alcohol consumption and other health behaviours. A large proportion of the research conducted within this area has been completed on adolescents and young adults. This is unsurprising giving the body of literature supporting the influence of peer pressure on these age groups (Plotnikoff, Costigan, Karunamuni & Lubans, 2013; Reyna & Farley, 2006); however, more needs to be done to understand the impact of similar environmental and social factors for other age groups in order to fully understand the potential impact on health behaviours. To date, the vast majority of examinations assessing the role of environmental influences for adults has been conducted on walking behaviours alone (Ball, Timperio, & Crawford, 2006).

As mentioned, health psychologists have been criticised for overly focusing on cognitive aspects of health behaviour change (Jeffery, 2004; Young et al., 2014). Along with the mixed findings for behaviour change interventions (Adams & White, 2005; Bridle et al., 2005) and given the growing body of research outlined above on the role of social and environmental factors on health behaviours, researchers have called for greater consideration of social influences within health behaviour change theories and
for future investigations to move past individual-level approaches (Ball et al., 2006; Nelson et al., 2008; Stevens et al., 2017). To date, the role of social influences within these theories is varying, poorly defined and lacking in-depth examination (Schüz et al., 2012). In two studies examining both individual and contextual factors that predict physical activity, Schüz and colleagues (2012) found evidence to support the role of contextual factors for health behaviours, specifically physical activity. Through multilevel modelling and after controlling for education, their first study found that GDP (contextual factor) and health attitudes (individual factor) predicted physical activity among a large sample of German adults (N = 6,201). To elucidate this finding, their second study assessed interactions between individual and contextual factors among a high-risk group (65+ years). The results of such found that district-level GDP significantly moderated the relations between individual levels of action planning and coping planning for physical activity (Schüz et al., 2012).

Through a dual-process framework and with more of a conceptual approach, Kremers and colleagues (2006) posited a model that assessed how conscious and unconscious environmental influences can directly and indirectly acts as causal mechanisms for behaviour. Similar to other researchers listed above, the authors argued that greater action needs to be paid to causal models and interventions that focus on promoting action and behaviour change, rather than cognitive perceptions and mere motivation (Kremer et al., 2006; Brug, Oenema, & Ferreira, 2005). With a focus on energy balance-related behaviours (combination of diet and physical activity behaviours), the proposed Environmental Research framework for weight Gain prevention (EnRG) argues for more consideration of environmental factors from a macro- and micro-level, as well as four different types (e.g., physical, political, economic and sociocultural), that can act as both direct and indirect causal mechanisms.
for the resulting behaviours (Kremer et al., 2006). Acknowledging the body of evidence to support the impact of cognitive factors on intentions and health behaviours (Armitage, & Conner, 2001; Godin, & Kok, 1996), the model discusses how behaviour-specific cognitions can act indirectly and mediate the relationship between the environmental influence and the resulting behaviour (e.g., poor accessibility of health foods may reduce self-efficacy expectations towards healthy eating, or high prices of health foods may have a negative impact on attitudes related to healthy eating). Whereas on the other side, the environmental influence can have an automatic and unconscious influence on the behaviour, acting in a similar way to that outlined by Reyna and Farley’s (2006) social heuristic.

The EnRG (Kremer et al., 2006) is very much in line with one of the main recommendations made by Norman and Conner (1995) in their narrative review of the role of social cognitions for predicting health behaviours, calling for greater consideration of the interaction between social influences and perceived threat. Citing similar criticisms to those that have been aimed at dual process theories from a social-cognitive perspective (e.g., varying terminology across theories for similar concepts, lack of definition concerning interactions between concepts), others have argued that greater theoretical integration should be possible across varying perspectives (Young et al., 2014). In particular, following a review of social cognitive theories for physical activity in adolescents, Plotnikoff and colleagues (2013) called for greater theoretical integration across social-cognitive theories that included more multi-level environmental influences and ecological approaches for health behaviours.

7.2.2.2 Comparative risk perceptions

The current thesis found evidence for a consistent comparison between individuals and others from their social networks, in terms of their personal
susceptibility for CVD and efficacy appraisals for the associated health behaviours (see section 6.1). When assessing just risk perception, there are common and consistent trends for the influence of normative beliefs and comparative risk that highlight the impact of social influence on various health risks (Clemens, Thombs, Olds, & Gordon, 2008; Weinstein, 1984; Weinstein & Klein, 1995). These results display the influence on associated risk outcomes from individual’s perceptions of others and their perceptions about what important others believe to be important. Given the unique social situation that college students are in and their increased likelihood to be effected by peer pressure, normative beliefs have predominantly been examined for alcohol risks and behaviours among this population (Borsari & Carey, 2001, 2003; Read, Wood, Davidoff, McLacken, & Campbell, 2002; Thombs, Ray-Tomasek, Osborn, & Olds, 2005). A few examples can be found when normative beliefs have been considered for different diseases and health behaviours (Clemens et al., 2008; Conn, Tripp-Reimer, & Maas, 2003; Yang et al., 2012). These results have shown how comparisons to close friends and family members can increase the likelihood to carry out physical activity and information-seeking behaviour for cancer.

Investigations into the influence of normative beliefs for specific health risks are minute in comparison to the body of literature examining comparative risk perceptions for other threats (Katapodi et al., 2004; Park & Ju, 2016; Popova & Halpern-Felsher, 2016; Sproesser et al., 2015). As discussed in section 4.1, little has been done for CVD in comparison to other diseases. Given that results, which are found for one disease or health behaviour, do not necessarily carry over for another, further investigation into such for CVD and the associated health behaviours is warranted. For the few studies that have examined comparative risk for CVD, results were in support of comparative optimism among their participants for CVD risk perceptions. It should be noted though
that two studies were completed on cardiac patients (Aalto et al., 2007; Thakkar et al., 2016) and the other on participants between the age range of 40 to 60 years (Radcliffe & Klein, 2002). Furthermore, the three studies measured risk perceptions for CHD, MI and CVD. Therefore, generalisation of the results across different populations and CVD manifestations should be treated with caution. Aalto et al. (2007) in their examination of the differences in MI risk perception across socio-demographic groups did find that comparative optimism was more likely among men and those with higher education. The samples for both study two and three in the current thesis were characterised by quite high levels of education and therefore, findings are in line with the results of the previous research.

Given the general body of literature examining comparative risk perceptions and the evidence to support a difference in such compared to personal perceptions, some researchers have assessed how comparative risk perceptions and optimistic bias from such impact on health communications (Lipkus & Klein, 2006; Zhao & Nan, 2016). In a recent study examining cancer information seeking behaviours among smokers, Zhao and Nan (2016) found that optimistic comparative risk perceptions moderated the relationship between personal risk and whether participants partook in cancer information seeking. The authors found that smokers did believe themselves to be at less of a risk for cancer than others. Furthermore, even among those with high personal risk of lung cancer, if they also had high levels of optimistic comparative risk, it weakened cancer seeking information behaviour. In a study that manipulated the levels of personal and comparative risk information for colorectal cancer, Lipkus and Klein (2006) found greater screening intentions and less ambivalence about the particular screening behaviour (e.g., FOBT) among the group who received higher levels of social
comparison risk information, compared to those who received more absolute risk information and the control group.

Utilising a think aloud methodology, Nolan et al. (2015) noted how diabetic patients when reacting to online information about CVD discounted the personal relevance of the information by drawing on a number of health beliefs, two of which were family history and personal experiences. The current thesis did find quantitative evidence to support a difference between participants’ personal and comparative susceptibility for CVD, and the qualitative findings would suggest that participants were using comparative examples to base their own threat and efficacy appraisals on. However, no other suggestions for the role of comparative threat and efficacy appraisals can be made from the current investigations. It should also be noted that no quantitative results were found to support any fear-control processes, like denial and avoidance, from participants in relation to the CVD risk messages, and therefore the findings are slightly dissimilar to those of Nolan and colleagues (2015). Previous research has found evidence of the moderating effect of comparative risk for health communications (Lipkus & Klein, 2006; Zhao & Nan, 2016), and future research may consider doing so for CVD communications.

The results in this thesis highlight the difference between comparative and personal susceptibility across young and old age groups. Additionally, the findings show the large number of vicarious experiences that participants drew on when making their own personal threat and efficacy appraisals for CVD and the associated health behaviours. Given the large body of literature comparing personal and comparative risk perceptions (Clemens, Thombs, Olds, & Gordon, 2008; Weinstein, 1984; Weinstein & Klein, 1995) and the results of this thesis, in the future dual processing theories of health such as the EPPM may benefit from greater consideration of these social
comparative perceptions. In a review article discussing the large use of social-cognitive models for examining health behaviours, Mielewczyk and Willig (2007) did call for a larger focus on social influences that can affect various health behaviours. However, the authors warned of a tendency to re-dress “old clothes” (e.g., definitions and measurements of model variables) rather than seeking new and more recently relevant developments.

However, measures that are more attuned to where the individual is drawing their comparison from for their threat and efficacy appraisals need to be developed. From the current findings, it is suggested that future measures seek to examine the use of comparative examples for personal evaluations of risk. Lastly, future research would benefit from use of more think aloud methodologies, in particular to aid with the suggestion above for elucidating the situations where individual draw on comparative examples for their own personal threat and efficacy appraisal, and to help with the lack of information around the operational definitions of EPPM theoretical constructs and the ‘critical point’ for danger- or fear-control processes (Maloney et al., 2011; Popova, 2012).

7.2.3 Practical implications

Issues for health literacy raised by both studies two and three for a younger and older Irish sample were mentioned in section 4.4 and 5.6. The lack of family history reported by the younger population in study two was inconsistent with the current rates of CVD in Ireland and Europe (Eurostat, 2009; Kabir et al., 2013; McGee, 2010) and could suggest a lack of awareness among the sample tested. However, concerns with the sample tested that may suggest a biased sample in this instance should also be taken into consideration with this suggestion (see section 7.3). There have been a number of large scale projects carried out into levels of health literacy and general health
knowledge among students and young adults (Gaspar, de Matos, Luszczynska, Baban, & Wit, 2014; Haase, Steptoe, Sallis, & Wardle, 2004; Steptoe et al., 2002). Many of the findings from across recent times and further back highlight a considerable lack of awareness among young adults for their health risks, and the connections between lifestyle or health behaviours for different diseases. Previous research has shown that awareness is linked to health risk perceptions (Peacey, Steptoe, Davidsdottir, Baban, & Wardle, 2006; Peltzer & Pengpid, 2014; Peltzer, Pengpid, Yung, Aounallah-Skhiri, & Rehman, 2016; Steptoe et al., 2002; Steptoe et al., 1995), and as discussed in chapter two and section 4.1, many of the health communication and behaviour models emphasis cognitive processes such as attitudes and risk perceptions for influencing the outcome health behaviour.

Large-scale investigations have been completed into the levels of awareness among young adults for general health, lifestyle behaviours, cancer and smoking. In a couple of the investigations looking at general health, awareness for the risks of heart disease was measured (Peltzer et al., 2016; Steptoe & Wardle, 2001). However, to the author’s knowledge, no assessment of heart disease or CVD health literacy among young adults has been completed to the level of others for general health, smoking or cancer. In an older study examining links between awareness of smoking and the risks for cancer and heart disease, Steptoe and colleagues (1995) found that the awareness for the link between smoking and lung cancer was remarkably high among students; however, the same could not be said for heart disease, and results varied for such across a number of European countries. This same result was repeated in a more recent assessment (Steptoe et al., 2002). Additionally, Peltzer and colleagues (2016) found that among health sciences and non-health science students, there were inconsistent results for the awareness between different health behaviours and heart disease. Awareness
was high for smoking and exercise, but not for alcohol and fat consumption. Calls have been made already within the literature for greater communication of health risks for younger adults (Peltzer et al., 2016; Steptoe & Wardle, 2001). However, it has been highlighted that a focus on the links between health behaviours and the environmental and personal factors which can affect such needs to be included (Haase et al., 2004).

In comparison, the older population sampled in study three did report high rates of awareness for CVD and the associated health behaviours. Inconsistencies were noted though in participants’ reporting of their own previous medical history and marked differences between the levels of awareness for different diseases (e.g., cancer) and CVD manifestations (e.g., stroke). This was along with a consistent finding of participants needing assistance and/or clarification from the interviewer within the think aloud methodology when completing the RBD scale. Some previous research has highlighted the differences between reported medical histories from the perspective of the medical professional in comparison to the individual (Haynes & Cook, 2007; van der Weijden, van Steenkiste, Stoffers, Timmermans, & Grol, 2007). For CVD, van der Weijden et al. (2007) found that the rate of incorrect reporting of CVD risk perception was as high as one in five for patients at a high risk of CVD. In a comparison of 322 patients’ self-reports and their case notes from UK-based hospitals, low agreement and little relationship were found for a number of modifiable risk factors (smoking, alcohol use, obesity, diet, and physical activity). In particular for smoking, diet and exercise (Haynes & Cook, 2007), patients reported little awareness for the health promotion they had received after treatment within the hospital, and the authors called for clearer guidelines around the identification and “treatment” of modifiable risk factors for both staff and patients of the hospital.
The importance of clear information and instructions for health and modifiable risk factors cannot be understated, given the implications of such for adherence, health outcomes and quality of life for the individual (Anderson et al., 2007; Gonzalez-Chica et al., 2016; Miller, 2016; Owen-Smith et al., 2016). It is a complicated task given the variances in health literacy levels, impacted by education levels, and the difficulties which the general population regularly report when presented with health risk information and measures (Bonner et al., 2014; Luger, Houston, & Suls, 2014; Nolan et al., 2015); these finding were replicated in the quantitative and qualitative data of the studies included in this thesis. Furthermore, it has been previously found that this task is more complicated for older individuals as the presence of more than one health concern can significantly impact on understanding of health information (Friis, Lasgaard, Osborne, & Maindal, 2016). Due consideration should be paid to the relevant population at which the health communication is aimed at, factors such as those listed above can play a greater role when populations are at an alleviated risk of the health threat or are a patient group already experiencing outcomes of such.

Future research may seek to build upon the findings from previous research about the relevant theories and models to develop tailored communications, utilising different formats and presentation styles. The current investigation did not manipulate the CVD risk messages in relation to any aspect except the types of threat and efficacy information included in the text-based messages as the overall aim of two of studies included were to assess the theoretical constructs of the EPPM (Witte, 1992; Witte & Allen, 2000; Witte et al., 2001). Previous research has found that tailored communications can be more persuasive for certain outcomes (McComas, 2006). The body of literature examining online (Atack, Luke, & Chien, 2008; Nolan et al., 2015; Redfern et al., 2014), narrative (Greene & Brinn, 2003; Johnson, 2004; Prati et al.,
visual (Connelly & Knuth, 1998; Lipkus & Hollands, 1999; Osborne, 2006) and culturally sensitive (Uskul & Oyserman, 2010) communications is growing extensively. Little has been done in terms of tailoring such formats in accordance with the constructs of the EPPM. Prati et al. (2012) did find that a narrative based communication was more persuasive for risk perceptions of influenza among individuals over 65 years, and higher efficacy appraisals for influenza vaccination. However, no differences were found for behavioural intentions. Additionally, Davis and colleagues (2009) found no difference between an EPPM-based and standard poster for communicating information about stroke among a large group of younger and older individuals.

There are arguments for and against the use of online, tailored communications. In a qualitative study assessing older patients (40+ years) from two health care systems in the US for their health information preferences, regardless of health literacy or numeracy ability, it was found that patients preferred to receive health information through in-person conversations with the medical professional (Gaglio, Glasgow, & Bull, 2012). However, given the current inadequate rates of health literacy observed across Europe (Sorensen et al., 2015), one-to-one communication with medical professionals does not seem feasible or cost-effective. Greater efforts need to be made to identify the most effective methods for communicating health information and risks. Many studies of tailored communications vary in terms of the theoretical background, methodology, measures and populations tested. Inconsistencies in results are not difficult to come by (McComas, 2006). It should be noted that a review conducted by Lipkus (2007) highlighted that similar to many of the health behaviour change models, the body of literature on numeric, verbal and visual based health risk communications is lacking clear, experimental tests of examining one format against another and utilisation of the theoretical constructs within the tailored communications.
Specific suggestions for future research given the current findings would be a large-scale assessment of the current rates of health literacy among a younger, Irish population. In order to further examine if the current findings are due to a bias among the tested sample or low levels of health literacy for the population as a whole. Additionally, the current studies could be replicated among more diverse samples or samples from other cultures to assess if the role of comparative examples is the same. The current studies presented some of the first experimental tests of theoretically-derived EPPM communications for CVD. Future studies could also examine if threat and efficacy appraisals, as well as recall for health information, are improved if the core propositions of the EPPM (e.g., certain levels of threat and efficacy information) were presented through a personal narrative or visual representation, rather than purely text.

7.3 Limitations

The limitations associated with the individual studies can be found in the respective chapters (see sections 3.6.1.3, 4.4.3, 5.4.3, and 6.4.4). This general limitations section, while still referring to the separate studies, will focus on the overall shortcomings of the methods and approaches described in this thesis. The populations sampled within each limit generalisations of the results and findings from the three studies. The sample population of study one were predominantly all psychology undergraduates who were attending an Irish university and who have experience of partaking in and designing psychological studies. Results may have been different if the sample had no psychological background and were less educated. For study two, the initial aim was to recruit a sample from the general population; however similar to study one, in the end quite a young, student population was sampled. The majority of the sample came from two universities within Dublin, broadening the range of the sample slightly in comparison to study one.
The sample population for study three were all well-educated (the vast majority of participants had at least some form of third level, if not secondary level, education). Furthermore, the age range of the sample was between 65 to 72 years, meaning caution should be taken when generalising to those over the age of 72 years. For the qualitative method, the majority of participants lived within a close range of TCD and were predominantly from an urban background, possibly raising questions about the socioeconomic representation of the sample. Relevant to this point and that outlined below about skewed data, consideration should be given to the potential of biased samples within this research. Concerns around participants reported medical history have been discussed in sections 4.4 and 5.6. Additionally, when reviewing participants’ reported health behaviours, it was found that the majority of all three samples stated that they had relatively good diets, took part in regular exercise, drank less than the suggested amount (see Appendix H) and didn’t currently smoke (either ex-smokers or had never smoked). Also, approximately two-thirds or lower of each sample reported that they did not have a history of depression and/or anxiety.

It has been stated several times that the data from study two and three suffered from being heavily skewed and transformations had to be completed on both sets of data in order to allow parametric analyses to be completed. Within both studies, measures of threat and efficacy appraisal suffered from ceiling effects. Furthermore, items included to measure negative emotional reactions and assessments of the health communications suffered from floor effects. As mentioned in section 7.2.2, the inclusion of measures assessing where participants are drawing their examples from (e.g., personal or comparative) could benefit future research. Cooper (2002) attributed the increasing normative beliefs about HIV and the consequences of risky sexual behaviour among young adults from the 1980s to 19990s as impacting on their
perceptions of alcohol use and risky sexual behaviour. The same could potentially be true of the current samples, particularly for the older sample given the large number of health campaigns aimed at this population. Additionally, the use of implicit measures of risk perception could be considered. Implicit measures are commonplace among the body of literature assessing attitudes (De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009). The amount of previous research assessing implicit risk perception for health hazards is not as extensive and the potential differences between implicit and explicit measures of CVD risk perception could be an area for future research.

Analyses were completed in line with the general linear model for reasons outlined below; however, future research if faced with the same issues of skewed data may considered testing the fit of a non-linear model. As both study two and three were seeking to replicate and build upon the findings of previous research examining the EPPM in terms of cancer risk perception, guidance for analytical procedures was taken from their examples (Carcioppolo et al., 2013; Witte et al., 2001). ANOVA is regularly referred to as a “robust” test and has the ability to remain relatively reliable even when its assumptions have been violated. Even given such, Field (2013) highlighted that care needed to be taken where sample sizes are unequal, lack of normality and/or heterogeneity of variance can impact on the type I and type II characteristics of the test.

As the majority of the analyses conducted within the current thesis were between groups’ designs, there were fewer complications for meeting assumptions when compared with mixed-factorial designs (Girden, 1992; Meyers, Gamst, & Guarino, 2006). As discussed in sections 4.2.6 and 5.2.6, the appropriate assumption checks were carried out (e.g., normality, homogeneity of variance, etc.), and where the data were found to violate such, transformations were completed. These transformations were then checked to ensure they were in line with the relevant assumptions of
inferential statistics. With all results, confidence intervals (back-transformed where necessary) and effect sizes were included in order to provide a true representation of the results that were not solely based on \( p \) values. Sample sizes for the message groups were relatively similar, and where differences did exist, analyses that took such into consideration were utilised (see section 5.3.4.3).

Additionally, a number of issues with the measures utilised in all three studies should be noted. Aside from the think aloud section in study three, the studies included in this thesis relied entirely on self-report questionnaires, as this approach was particularly suited to measuring threat and efficacy appraisals in relation to CVD and the associated health behaviours. It is well documented within psychological literature that the validity of self-report data can be negatively impacted by confounds, such as social desirability particularly when the topic is one of a potentially sensitive nature (Crowne & Marlowe, 1960). Attempts were made to alleviate any possible confounding effect from such, by reminding participants of the confidentiality of the studies, ensuring participants were aware that they could withdraw at any stage without penalty, and establishing a good rapport with participants when speaking in-person and in telephone conversations (Brener, Billy, & Grady, 2003; Tofthagen, 2012).

As discussed in the above sections and section 5.6, following the results of studies two and three, questions were raised about the effectiveness of the RBD at assessing threat and self-efficacy appraisals in particular. Furthermore, the lack of longitudinal measurement of behaviour and the problems with the use of behavioural intentions as a measure for behaviour should be considered (e.g., intention-behaviour gap; see Rhodes and de Bruijn (2013), and Sheeran (2002) for reviews). On a related note, the think aloud methodology employed in study three has its own limitations. Namely, think aloud studies rely on the individual verbalising their conscious thoughts
(Gardner & Tang, 2014). If the individual chooses not to do so, then it is not possible to
detect and use such for subsequent analyses. This limitation, along with the skewed data
and problems with the RBD measurements used do mean that psychometric issues are a
limitation of the research included in this thesis. As has been stated care should be taken
with the conclusions drawn from the analyses and future research may seek to include
elements to the design and analyses to avoid such problems.

7.4 Summary and Conclusion

The overall objective of this thesis was to examine dual information processing
of CVD risk communications through empirical manipulations of both information
processing modes, and to examine the effect of such on risk appraisals for CVD and
efficacy appraisals for the associated health behaviours. The studies conducted in this
thesis utilised a range of research methods, sampled both a younger and older
population, and are among some of the first experimental tests of the EPPM for CVD
threat and efficacy appraisals. Communication has been acknowledged as the first step
in health behaviour change and is key to any intervention seeking to modify health
behaviours and the subsequent health outcomes (Katz & Wajngarten, 2015; Navar,
Stone, & Martin, 2016; Power, Swartzman, & Robinson, 2011; Witte, 1992). Study one
tested a novel manipulation of incidental dual information processing and examined its’
effects on CVD risk perception after presentation of a CVD risk communication.

No evidence was found to support the use of an incidental manipulation
containing images and word search puzzle to prime dual information processing modes
and impact CVD risk perception. In this instance following additional analyses, an
integral manipulation based on the CVD risk communications and utilising a theory
specialised for health communications was deemed more appropriate. Studies two and
three presented empirical tests of the EPPM for a younger and older population in terms
of their CVD threat appraisals and efficacy appraisals for the associated health behaviours. The studies added considerably to the small body of literature on the EPPM as to the author’s knowledge these are the first experimental tests of core EPPM theoretical constructs for CVD. Overall, there was a lack of evidence found to support the EPPM for CVD risk communications, suggesting that the EPPM might not be the most suitable model for developing CVD risk communications. Even given the lack of overall support for the EPPM, a number of key findings should be noted.

For younger samples, the findings did underline the importance of health risk awareness for younger individuals. For older individuals, it was found that appraisals can vary considerable depending on the particular threat in question (e.g., specific CVD manifestations), and the influence of social comparisons and efficacy is important. In particular the considerable use of comparative examples for establishing personal threat and efficacy appraisals should be given some reflection in future tests of, not just the EPPM, but other health decision-making and behaviour change models. Future research should continue with systematic, theory-lead and evidence-based efforts to further elucidate the most effective communication methods for CVD risk perceptions. Given the current findings it is suggested that such future research be tailored for specific disease manifestations and considerable attention paid to the measures used for assessing the different components of threat appraisals.
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Appendix A: Ethical Approval Letters

F.A.O. Sinead Moylett

School of Psychology Research Ethics Committee

6 January 2014

Dear Sinead Moylett,

The School of Psychology Research Ethics Committee has reviewed your application entitled “Dual information processing of health risk”, and I am pleased to inform you that it was approved.

Yours sincerely,

[Signature]

Richard Carson
Chair,
School of Psychology Research Ethics Committee

SCHOOL OF PSYCHOLOGY
Arás an Phiarasaigh
Trinity College
Dublin 2
F.A.O. Sinead Moylett

School of Psychology Research Ethics Committee

10 August 2015

Dear Sinead,

The School of Psychology Research Ethics Committee has reviewed your amendments to the application entitled “Dual information processing of health risk” and I am pleased to inform you that they have been approved.

Please note that you will be required to submit a completed Project Annual Report Form on each anniversary of this approval, until such time as an End of Project Report Form is submitted upon completion of the research. Copies of both forms are available for download from the Ethics section of the School website.

Adverse events associated with the conduct of this research must be reported immediately to the Chair of the Ethics Committee.

Yours sincerely,

Richard Carson
Chair,
School of Psychology Research Ethics Committee
FW: Sinead Moylett - Amendments to an Approved Study

From: Richard Carson
Sent: 20 January 2016 15:01
Toc: Luisa Byrne
Subject: Re: Sinead Moylett - Amendments to an Approved Study

Dear Luisa,

With respect to the proposed amendments to the Ethics Application submitted previously by Sinead Moylett, I am pleased to recommend that these be approved.

Best regards,
Richard

On 20 Jan 2016, at 14:52, Luisa Byrne <BYRNELU@tcd.ie> wrote:

Hi Richard,

For review please.

Regards,

Luisa Byrne
Executive Officer
Hi Sinead,

Please see the Chair’s response below.

From: Richard Carson
Sent: 21 June 2016 20:46
To: Luisa Byrne
Subject: Re: Valhey and Moylett Amendments

Dear Luisa,

With respect to the proposed amendments to the Ethics Application submitted previously by Sinead Moylett, I am pleased to recommend that these be approved.

Best regards,
Richard

On 20 Jun 2016, at 14:35, Luisa Byrne <BYRNELU@tcd.ie> wrote:

Hi Richard,

For review, please.

Regards,

Luisa Byrne
Executive Officer
Appendix B: Word Search Puzzles (Pilot Study)

Cognitive Word Search Puzzle

Please find the words listed below in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have 5 minutes to find all 7 words.

T K I Y N H J B O A Y J T M R
F T I W J Y W B Q V G A Q K Z
Q V B N R Y M K Y L Y H W N W
L S Y O O A Q G N F A I T J B
V Q S E H F N Q R B F D S P V
Q M J O Q K O O B K J D Q T A
A S I U Q K G U U Y W R L Q E
T H I N K I N G D K F A L K S
I G S S D S I G T U N H F R Q
A K L U K G N I W O N K W E E
V O Y Y Q L O G I C Y O U Y P
B F I O V E S T A D N Z A X Z
G N I Z Y L A N A N Y Z K L R
O V B L Q R E U B G B G S J T
Z E G J T I R M U H M F L A N

Analyzing  Rational
Knowing    Reasoning
Logic      Thinking
Mind
Affective Word Search Puzzle

Please find the words listed below in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have 5 minutes to find all 7 words.

G D H J Q O I J J Q S S H K E
I N O Q X E G L A L N Q R B H V
V I I N S F C E K D Y W U Y V
M M L C E T N J X E E D Z C C
I F J L N F O K R E Z T K Z K
N O I S S E R P M I Q L A C K
T E A C A E I O S J C C C G T
U T U O T L T R K U H I P D W
I A D T I I W Y E I I A I Z J
T T G T O N I L A P U N J X N
I S P N N G L A E P X U F K C
O Z R C X Z Q N Y G U E J P D
N E M X N D L P S U U V Q P B
K C A M G O W P E Y J L U U X
R R S V D V Y M Q K G N X T D

Emotion
Experiencing
Feeling
Impression
Intuition
Sensation
State of mind
Appendix C: Demographic Questionnaire (Pilot Study)

Age: ________________

Gender: □ Male □ Female

Nationality: ________________

Please indicate your martial status:

□ Single □ Married □ Living with a partner as if married
□ Separated □ Divorced □ Widowed

What is the highest level of education you have completed?

□ None
□ Primary level
□ Secondary level
□ Third level

Please state your employment status:

□ Student □ Full-time □ Part-time
□ Stay-at-home parent □ Retired □ Unemployed

Other (please explain) ___________________________________________
Appendix D: Participant Consent Form

Participant ID: ____________________________

Title of Project: Decision-making and health information

Name of Researcher: Sinéad Moylett

Please initial box

1. I confirm that I have read the information sheet for the above study and have had the opportunity to ask questions.

2. I am satisfied that I understand the information provided and have had enough time to consider the information.

3. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my legal rights being affected.

4. I agree to take part in the above study.

_________________________________________  ________________________
Name of Participant (printed)                  Date

__________________________________________
Signature
Appendix E: Details of Images Included in Image-based Manipulations (Study 1)

Table E.1 includes details of the 50 positive images chosen from the IAPS, and Table E.2 contains the information pertaining to the 50 negative images chosen.

Table E.1. IAPS details for the 50 images included in the positive image manipulation

<table>
<thead>
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<th>Description</th>
<th>Number</th>
<th>Mean Valence</th>
<th>Mean Arousal</th>
</tr>
</thead>
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<td>Baby</td>
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<td>8.20</td>
<td>4.57</td>
</tr>
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<td>8.19</td>
<td>4.61</td>
</tr>
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<td>4.51</td>
</tr>
<tr>
<td>Skier</td>
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<td>6.28</td>
</tr>
<tr>
<td>Babies</td>
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<td>4.7</td>
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<tr>
<td>NeutBaby</td>
<td>2260</td>
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<td>4.26</td>
</tr>
<tr>
<td>Family</td>
<td>2340</td>
<td>8.03</td>
<td>4.9</td>
</tr>
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<td>5210</td>
<td>8.03</td>
<td>4.6</td>
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<td>Family</td>
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<td>5.46</td>
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<td>Father</td>
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<td>7.81</td>
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<td>5910</td>
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<td>7.69</td>
<td>5.14</td>
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<td>2091</td>
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</table>

Note. The mean valence for the 50 positive images was 7.79. The mean arousal for the 50 positive images was 5.33 (SD = 0.78)
Table E.2. *IAPS* details for the 50 images included in the negative image manipulation

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<td>BurnVictim</td>
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</tr>
<tr>
<td>Cemetery</td>
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<td>2.55</td>
<td>4.06</td>
</tr>
<tr>
<td>Injury</td>
<td>3550</td>
<td>2.54</td>
<td>5.92</td>
</tr>
<tr>
<td>DrunkDriving</td>
<td>2751</td>
<td>2.67</td>
<td>5.18</td>
</tr>
<tr>
<td>Girl</td>
<td>2276</td>
<td>2.67</td>
<td>4.63</td>
</tr>
<tr>
<td>Assault</td>
<td>9429</td>
<td>2.68</td>
<td>5.63</td>
</tr>
<tr>
<td>SickKitty</td>
<td>9561</td>
<td>2.68</td>
<td>4.79</td>
</tr>
<tr>
<td>Attack</td>
<td>6370</td>
<td>2.70</td>
<td>6.44</td>
</tr>
<tr>
<td>Shipwreck</td>
<td>9620</td>
<td>2.70</td>
<td>6.11</td>
</tr>
<tr>
<td>Flood</td>
<td>9927</td>
<td>2.71</td>
<td>5.29</td>
</tr>
<tr>
<td>PlaneCrash</td>
<td>9611</td>
<td>2.71</td>
<td>5.75</td>
</tr>
<tr>
<td>Attack</td>
<td>6550</td>
<td>2.73</td>
<td>7.09</td>
</tr>
<tr>
<td>Fire</td>
<td>8485</td>
<td>2.73</td>
<td>6.46</td>
</tr>
<tr>
<td>Hunters</td>
<td>2688</td>
<td>2.73</td>
<td>5.98</td>
</tr>
<tr>
<td>Fire</td>
<td>9922</td>
<td>2.78</td>
<td>5.21</td>
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<tr>
<td>Smoke</td>
<td>9280</td>
<td>2.80</td>
<td>4.26</td>
</tr>
<tr>
<td>CryingFamily</td>
<td>2456</td>
<td>2.84</td>
<td>4.55</td>
</tr>
<tr>
<td>Pollution</td>
<td>9342</td>
<td>2.85</td>
<td>4.49</td>
</tr>
<tr>
<td>Bomb</td>
<td>9424</td>
<td>2.87</td>
<td>5.78</td>
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<tr>
<td>Assault</td>
<td>9427</td>
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<td>5.50</td>
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<tr>
<td>Accident</td>
<td>9610</td>
<td>2.89</td>
<td>5.23</td>
</tr>
<tr>
<td>Fire</td>
<td>9941</td>
<td>2.91</td>
<td>5.83</td>
</tr>
<tr>
<td>PieW/bug</td>
<td>7359</td>
<td>2.92</td>
<td>5.36</td>
</tr>
<tr>
<td>Boys</td>
<td>9530</td>
<td>2.93</td>
<td>5.20</td>
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<tr>
<td>Garbage</td>
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<td>2.93</td>
<td>4.38</td>
</tr>
<tr>
<td>Bomb</td>
<td>9630</td>
<td>2.96</td>
<td>6.06</td>
</tr>
<tr>
<td>SadGirls</td>
<td>2455</td>
<td>2.96</td>
<td>4.64</td>
</tr>
<tr>
<td>ScaredChild</td>
<td>9041</td>
<td>2.98</td>
<td>4.64</td>
</tr>
<tr>
<td>Seal</td>
<td>9180</td>
<td>2.99</td>
<td>5.02</td>
</tr>
<tr>
<td>Mud</td>
<td>9031</td>
<td>3.01</td>
<td>4.82</td>
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<tr>
<td>Fire</td>
<td>9623</td>
<td>3.04</td>
<td>6.05</td>
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<tr>
<td>Riot</td>
<td>2691</td>
<td>3.04</td>
<td>5.85</td>
</tr>
<tr>
<td>Ruins</td>
<td>9470</td>
<td>3.05</td>
<td>5.05</td>
</tr>
<tr>
<td>Assault</td>
<td>9426</td>
<td>3.08</td>
<td>6.51</td>
</tr>
<tr>
<td>AttackDog</td>
<td>1525</td>
<td>3.09</td>
<td>5.68</td>
</tr>
<tr>
<td>Jet</td>
<td>9622</td>
<td>3.10</td>
<td>6.26</td>
</tr>
<tr>
<td>ShipWave</td>
<td>9930</td>
<td>3.12</td>
<td>5.71</td>
</tr>
</tbody>
</table>

*Note.* The mean valence for the 50 negative images was 2.73. The mean arousal for the 50 negative images was 5.58 (SD = 0.75).

Additional information on the cognitive images from IAPS (P. J. Lang et al., 2008), the SUN2012 database (Xiao et al., 2010) and from public sources are presented in tables E.3, E.4 and E.5.
Table E.3

**IAPS details for the four images included in the cognitive image manipulation**

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Mean Valence</th>
<th>Mean Arousal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>2377</td>
<td>5.19</td>
<td>3.50</td>
</tr>
<tr>
<td>Chess</td>
<td>2580</td>
<td>5.71</td>
<td>2.79</td>
</tr>
<tr>
<td>Chess</td>
<td>2840</td>
<td>4.91</td>
<td>2.43</td>
</tr>
<tr>
<td>Puzzle</td>
<td>7061</td>
<td>5.40</td>
<td>3.66</td>
</tr>
</tbody>
</table>

*Note.* The mean valence for the 4 cognitive images was 5.30. The mean arousal for the 4 cognitive images was 3.10.

Table E.4

**Additional information for SUN2012 database images included in the cognitive image manipulation**

<table>
<thead>
<tr>
<th>SUN2012 Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio Lab</td>
<td>sun_acliytrpktltxwxs</td>
</tr>
<tr>
<td>Bio Lab</td>
<td>sun_ayvmvpeardmaaa</td>
</tr>
<tr>
<td>Classroom</td>
<td>sun_aqroqlfmcxudupfl</td>
</tr>
<tr>
<td>Classroom</td>
<td>sun_ayknoxfplkciot</td>
</tr>
<tr>
<td>Classroom</td>
<td>sun_azqeykgdrdpdnaho</td>
</tr>
<tr>
<td>Lab classroom</td>
<td>sun_babuzzhmyfnkpufl</td>
</tr>
<tr>
<td>Lab classroom</td>
<td>sun_bijnronkwegopwyt</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_acxeanaajkgiansf</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_aifcgjosztlygfsn</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_aldqixndbylnvntt</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_azjxvrativdfckwe</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_bbwqiyuhqysoago</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_bdhctlpgeezwoyxa</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_bfvwmplpimdpsdk</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_bgdvjuoxaemsrdld</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_bkkmphelysbkwzdzu</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_bnepzzxznwmylxt</td>
</tr>
<tr>
<td>Lecture Room</td>
<td>sun_byvcczbutpcwiv</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_axxuabvxeknsyght</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_bazturafjkboskp</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_bbfrwmdxblvkul</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_berfoaxqyflhxngo</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_bbdbivbptlrlauhy</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_broomrhymakqha</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_bsupckdvoirfzwq</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_bxevlhghegtaiyv</td>
</tr>
<tr>
<td>Library Indoor</td>
<td>sun_bwivnmhuwyxehzj</td>
</tr>
<tr>
<td>Misc</td>
<td>sun_aetouxtrfrfwgg</td>
</tr>
<tr>
<td>Physics Lab</td>
<td>sun_abbwulohhszvyyij</td>
</tr>
<tr>
<td>Physics Lab</td>
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<tr>
<td>Reading Room</td>
<td>sun_ajavxetmpwprmr</td>
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<tr>
<td>Reading Room</td>
<td>sun_amfnpqthtlydaduh</td>
</tr>
<tr>
<td>Reading Room</td>
<td>sun_axlbejrjvycgffuwk</td>
</tr>
<tr>
<td>Study Hall</td>
<td>sun_aubswzjqjygbvpc</td>
</tr>
</tbody>
</table>
Table E.5

Additional information for the images included in the cognitive image manipulation taken from Google Images (category and associative websites).

<table>
<thead>
<tr>
<th>Category</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chess</td>
<td><a href="http://www.businessinsider.com/anand-on-how-computers-have-changed-chess-2013-11">http://www.businessinsider.com/anand-on-how-computers-have-changed-chess-2013-11</a></td>
</tr>
<tr>
<td>Chess</td>
<td><a href="http://www.theguardian.com/sport/2013/nov/22/magnus-carlsen-chess-champion-glory">http://www.theguardian.com/sport/2013/nov/22/magnus-carlsen-chess-champion-glory</a></td>
</tr>
<tr>
<td>Chess</td>
<td><a href="http://commons.wikimedia.org/wiki/File:Chess_board_in_park_kiev.JPG">http://commons.wikimedia.org/wiki/File:Chess_board_in_park_kiev.JPG</a></td>
</tr>
<tr>
<td>Cross word</td>
<td><a href="http://www.indezine.com/products/clipmedia/franklinphotoeffectssppt.html">http://www.indezine.com/products/clipmedia/franklinphotoeffectssppt.html</a></td>
</tr>
<tr>
<td>Cross word</td>
<td><a href="http://www.huffingtonpost.co.uk/alan-connor/crossword-history_b_4464417.html">http://www.huffingtonpost.co.uk/alan-connor/crossword-history_b_4464417.html</a></td>
</tr>
<tr>
<td>Cross word</td>
<td><a href="http://arleenbradley.com/2013/05/5-job-search-secrets-hidden-in-newspapers/">http://arleenbradley.com/2013/05/5-job-search-secrets-hidden-in-newspapers/</a></td>
</tr>
<tr>
<td>Cross word</td>
<td><a href="http://www.h2uwomen.com/category/60-70/">http://www.h2uwomen.com/category/60-70/</a></td>
</tr>
<tr>
<td>Sudoku</td>
<td><a href="http://www.usedeverywhere.com/life-sudoku/">http://www.usedeverywhere.com/life-sudoku/</a></td>
</tr>
<tr>
<td>Sudoku</td>
<td><a href="http://www.dailymail.co.uk/sciencetech/article-1346011/Google-application-uses-phone-camera-solve-sudoku-puzzle.html">http://www.dailymail.co.uk/sciencetech/article-1346011/Google-application-uses-phone-camera-solve-sudoku-puzzle.html</a></td>
</tr>
</tbody>
</table>
Appendix F: Word Search Puzzles (Study 1)

Positive Affective Word Search Puzzle

Please find the words listed on the next page in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have 10 minutes to find all 30 words.
<table>
<thead>
<tr>
<th>LOVE</th>
<th>SKYSCRAPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORE</td>
<td>SUCCESS</td>
</tr>
<tr>
<td>JOY</td>
<td>BOLT</td>
</tr>
<tr>
<td>BRIDGE</td>
<td>KISS</td>
</tr>
<tr>
<td>FUNNY</td>
<td>TICKET</td>
</tr>
<tr>
<td>HIGHWAY</td>
<td>HAPPY</td>
</tr>
<tr>
<td>LAUGHTER</td>
<td>JUNGLE</td>
</tr>
<tr>
<td>ZIPPER</td>
<td>ENJOY</td>
</tr>
<tr>
<td>ECSTATIC</td>
<td>AIRPORT</td>
</tr>
<tr>
<td>JOB</td>
<td>ENTHUSIASTIC</td>
</tr>
<tr>
<td>FUN</td>
<td>HOCKEY</td>
</tr>
<tr>
<td>ARROW</td>
<td>THRILL</td>
</tr>
<tr>
<td>ROMANTIC</td>
<td>NEWS</td>
</tr>
<tr>
<td>SOCCER</td>
<td>PASSION</td>
</tr>
<tr>
<td>VICTORY</td>
<td>COUNTRY</td>
</tr>
</tbody>
</table>
Negative Affective Word Search Puzzle

Please find the words listed on the next page in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have 10 minutes to find all 30 words.
BETRAY  SKYSCAPER
STORE   FURIOUS
TERRIFIED BOLT
BRIDGE  AFRAID
DISASTER TICKET
HIGHWAY ASSAULT
TRAGEDY JUNGLE
ZIPPER  WAR
FAIL    AIRPORT
JOB     STRESS
ABUSE   HOCKEY
ARROW   HATE
HUMILIATION NEWS
SOCCER  SHAME
NIGHTMARE COUNTRY
Cognitive Word Search Puzzle

Please find the words listed on the next page in the word search. Circle each word within the puzzle as you find it and indicate the order in which you have found the words. You will have 10 minutes to find all 30 words.
<table>
<thead>
<tr>
<th>ANALYSING</th>
<th>SKYSCRAPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORE</td>
<td>INTELLECT</td>
</tr>
<tr>
<td>EXAMINE</td>
<td>BOLT</td>
</tr>
<tr>
<td>BRIDGE</td>
<td>LOGIC</td>
</tr>
<tr>
<td>COMPREHEND</td>
<td>TICKET</td>
</tr>
<tr>
<td>HIGHWAY</td>
<td>THINKING</td>
</tr>
<tr>
<td>INSPECT</td>
<td>JUNGLE</td>
</tr>
<tr>
<td>ZIPPER</td>
<td>PENSIVE</td>
</tr>
<tr>
<td>INVESTIGATE</td>
<td>AIRPORT</td>
</tr>
<tr>
<td>JOB</td>
<td>MIND</td>
</tr>
<tr>
<td>STUDY</td>
<td>HOCKEY</td>
</tr>
<tr>
<td>ARROW</td>
<td>RATIONAL</td>
</tr>
<tr>
<td>FACT</td>
<td>NEWS</td>
</tr>
<tr>
<td>SOCCER</td>
<td>REASONING</td>
</tr>
<tr>
<td>KNOWING</td>
<td>COUNTRY</td>
</tr>
</tbody>
</table>
Appendix G: CVD Risk Message (Study 1)

Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the most common cause of death in Ireland. In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due to heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases. This is more than all cancers combined.

1 in 4 people will die from heart disease or stroke in Ireland. This equates to approximately 10,000 people in Ireland who will die each year from a heart attack, stroke or other associated conditions. Many of these deaths are premature because those people were not aware that they had heart disease, which they could have identified early and learned to manage well over time.

Smoking, raised blood pressure, raised blood cholesterol, physical inactivity, obesity and diabetes mellitus are the major factors that increase the risk of cardiovascular disease. Almost two-thirds of middle-aged and older adults in Ireland have at least 2 of 4 key risk factors for cardiovascular disease – raised blood pressure, raised cholesterol, obesity and/or smoking.

In Ireland, over half of the adult population have an unhealthy body weight – 38% of the population are classified as overweight and a further 23% as obese, using independently measured Body Mass Index (BMI). Additionally, alcohol consumption is over 40% higher than the EU average. While the smoking ban in the workplace introduced in 2005 has significantly reduced exposure to secondary smoke, smoking rates for adults are still high, at 29% (31% of men and 27% of women).
Appendix H: Demographic, Medical and Health Information Questionnaire

Participant ID: ____________________  Date: ____________________
Age: _______________  Gender:  ☐ Male  ☐ Female
Nationality: ____________________

Please indicate your marital status:
☐ Single  ☐ Married  ☐ Living with a partner as if married
☐ Separated  ☐ Divorced  ☐ Widowed

What is the highest level of education you have completed?
☐ None
☐ Primary level
☐ Secondary level
☐ Third level

Please state your employment status:
☐ Student  ☐ Full-time  ☐ Part-time
☐ Stay-at-home parent  ☐ Retired  ☐ Unemployed
Other (please explain) ____________________

Do you have any previous history of cardiovascular disease?
☐ Yes  ☐ No
If yes, please state what ____________________

Do you have any other on-going health problems?
☐ Yes  ☐ No
If yes, please state what ____________________

Do you have a family history of cardiovascular disease?
☐ Yes  ☐ No
If yes, please state what ____________________
Have you ever been diagnosed with depression or an anxiety disorder?

☐ Yes  ☐ No

Height:  __________________________
Weight:  __________________________

Please state your eating habits: (please tick the most appropriate box)

☐ I don’t pay any attention to what I eat
☐ Sometimes I take up a healthy diet because I feel guilty, but eventually I always go back to my previous eating habits
☐ I usually watch what I eat but sometimes I like to treat myself
☐ I always watch what I eat and my diet is very healthy

It’s recommended that adults take part in moderate activity or exercise for at least 30 minutes a day on 5 days a week (or 150 minutes a week).

Please indicate according to the above suggestion, if you…..

☐ Exercise for the suggested amount
☐ Exercise for more than the suggested amount
☐ Exercise for less than the suggested amount
☐ Do not exercise

It’s recommended that men should drink less than 21 units of alcohol per week and that women should drink less than 14 units per week.
One unit = half pint of beer or a small glass of wine or 25ml of spirits.

In an average week, would you……

☐ Drink the suggested amount of alcohol
☐ Drink more than the suggested amount of alcohol
☐ Drink less than the suggested amount of alcohol
☐ Do not drink alcohol

Are you a……

☐ Current smoker  ☐ Ex-smoker  ☐ Never smoked
Please complete each of the following questions, using the associated scales. Circle the number that best describes your answer for each question.

1. Given the information you have just received, how likely do you think it is that you might be diagnosed with cardiovascular disease at some stage in your life?
   Not at all likely
   
   1  2  3  4  5  6  7

   Very likely

2. Given the information you have just received, how likely do you think it is that an average person of the same age and gender as you might be diagnosed with cardiovascular disease at some stage in his or her life?
   Not at all likely

   1  2  3  4  5  6  7

   Very likely

3. If you were diagnosed with cardiovascular disease, how serious would that be for you?
   Not at all serious

   1  2  3  4  5  6  7

   Very serious

4. How worried are you by cardiovascular disease?
   Not at all worried

   1  2  3  4  5  6  7

   Very worried

5. How anxious are you that you may have symptoms of cardiovascular disease?
   Not at all anxious

   1  2  3  4  5  6  7

   Very anxious

6. In general, do you think that people can take actions to prevent getting cardiovascular disease?
   Not at all

   1  2  3  4  5  6  7

   Definitely
7. In general, do you think that you, yourself, can take actions to prevent yourself from getting cardiovascular disease?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Definitely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

8. Would you be willing to take regular action to prevent cardiovascular disease?

<table>
<thead>
<tr>
<th>Not at all willing</th>
<th>Very willing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

9. Would you be willing to take a test to see if you have cardiovascular disease?

<table>
<thead>
<tr>
<th>Not at all willing</th>
<th>Very willing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

10. How likely is it that you will pay more attention to symptoms of cardiovascular disease in the future?

<table>
<thead>
<tr>
<th>Not at all likely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

11. How clear did you find the risk information you were given?

<table>
<thead>
<tr>
<th>Not at all clear</th>
<th>Very clear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

12. How confident do you feel that you have understood the risk information you were given?

<table>
<thead>
<tr>
<th>Not at all confident</th>
<th>Very confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

13. How satisfied are you that you were given enough information to answer the above questions?

<table>
<thead>
<tr>
<th>Not at all satisfied</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix J: Participant Information & Debriefing Sheet for Study 1

Information Sheet

You are being invited to take part in a research study in the School of Psychology, TCD that aims to investigate decision-making and health information.

What will happen to me if I take part?
If you decide to take part in this study, you will first be asked to complete a questionnaire providing some information about yourself, your lifestyle and your health. You will be asked to view and pay attention to a set of images that will be displayed on a computer screen. Following this, you will be given a puzzle to complete and afterwards asked to read some health information. After reading the health information, you will be asked to complete a number of questionnaires relating to your thoughts, feelings and health. If at any stage you feel uncomfortable with the images being displayed or any of the questions being asked, you are free to not view the images, to not answer the question or withdraw from the study at any time without giving a reason. Additionally, there will be information provided for health, information and counselling services should you have any questions relating to some of the issues raised in this study. The researchers contact information will also be provided should you have any further questions.

How long will my part in the study last?
The study will take approx. 45mins to complete.

What are my rights if I join the study?
Participation in the study is entirely voluntary and if you agree to participate you have the following rights:

1. The information from this study will be kept strictly confidential and will not be made available to any other people.
2. We will aim to publish our results in scientific journals but any information we have will be completely anonymous and presented as a group.
3. As participation is completely voluntary, you are free to withdraw from the study at any time. You are also free to withdraw your data at the conclusion of your participation should you so wish.
4. Under the Freedom of Information Act you can have access to any information we store about you, if requested.

Sinéad Moylett,                      Prof. David Hevey
School of Psychology,               School of Psychology,
Áras an Phiarsaigh,                 Áras an Phiarsaigh
Trinity College Dublin,             Trinity College Dublin,
01 8963083                         01 8962406
moyletts@tcd.ie                     heveydt@tcd.ie
Debriefing Sheet

What is the study?
Thank you for taking part in this study. Hopefully you enjoyed the experience. The data collected during this study will be used to investigate decision-making and health information.

Who do I contact for more information or if I have further concerns?
If you have any questions about your participation, please feel free to contact the researchers:

Sinéad Moylett
School of Psychology,
Áras an Phiarsaigh,
Trinity College Dublin,
Dublin 2.
01 8963083
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Prof. David Hevey
School of Psychology,
Áras an Phiarsaigh
Trinity College Dublin,
Dublin 2.
01 8962406
heveydt@tcd.ie

If you would like to talk to someone about any of the health issues raised in this study, please contact your local health service or GP. For students of TCD, you can contact the College Health Centre at 01 8961591 or 01 8961556. If you would like more information about heart healthy lifestyles or cardiovascular disease, please see http://ihda.ie/ and http://www.irishheart.ie.

If you would like to take to someone about any of the topics raised in this study, The Samaritans and Aware both provide confidential services. The Samaritans can be contacted on 1850 60 90 90 or jo@samaritans.org. Aware can be contacted on 01 661 7211 or info@aware.ie.

Thank you!
Appendix K: Descriptive Statistics & Additional Analyses for Study 1

Table K.1

Study 1 Additional Descriptive Statistics

<table>
<thead>
<tr>
<th>PANAS-X Subscale</th>
<th>Positive Affective (n = 16)</th>
<th>Negative Affective (n = 17)</th>
<th>Cognitive (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD: 95% CI)</td>
<td>M (SD: 95% CI)</td>
<td>M (SD: 95% CI)</td>
</tr>
<tr>
<td>Fear</td>
<td>8.00 (3.60; 6.08, 9.92)</td>
<td>8.06 (2.66; 6.69, 9.42)</td>
<td>8.11 (3.56; 6.34, 9.88)</td>
</tr>
<tr>
<td>Sadness</td>
<td>7.38 (2.63; 5.97, 8.78)</td>
<td>9.00 (4.72; 6.57, 11.43)</td>
<td>6.61 (3.07; 5.08, 8.14)</td>
</tr>
<tr>
<td>Guilt</td>
<td>7.25 (3.02; 5.64, 8.86)</td>
<td>9.53 (4.24; 7.35, 11.71)</td>
<td>7.44 (2.60; 6.15, 8.73)</td>
</tr>
<tr>
<td>Hostility</td>
<td>7.13 (2.50; 5.79, 8.46)</td>
<td>7.82 (1.98; 6.81, 8.84)</td>
<td>6.89 (1.28; 6.25, 7.52)</td>
</tr>
<tr>
<td>Shyness</td>
<td>7.13 (3.32; 5.35, 8.90)</td>
<td>7.12 (2.96; 5.60, 8.64)</td>
<td>5.22 (1.67; 4.39, 6.05)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>8.19 (3.39; 6.38, 9.99)</td>
<td>10.12 (3.67; 8.23, 12.01)</td>
<td>11.44 (4.26; 9.33, 13.56)</td>
</tr>
<tr>
<td>Joviality</td>
<td>21.56 (6.52; 18.09, 25.04)</td>
<td>22.06 (7.99; 17.95, 26.17)</td>
<td>20.39 (8.59; 16.12, 24.66)</td>
</tr>
<tr>
<td>Self Assurance</td>
<td>12.19 (3.75; 10.19, 14.18)</td>
<td>14.24 (5.37; 11.48, 17.00)</td>
<td>13.00 (5.18; 10.42, 15.58)</td>
</tr>
<tr>
<td>Attentiveness</td>
<td>13.94 (1.73; 13.02, 14.86)</td>
<td>13.35 (3.50; 11.55, 15.15)</td>
<td>12.11 (3.22; 10.51, 13.71)</td>
</tr>
<tr>
<td>Serenity</td>
<td>11.31 (2.27; 10.10, 12.52)</td>
<td>10.71 (2.29; 9.53, 11.88)</td>
<td>10.61 (2.93; 9.15, 12.07)</td>
</tr>
<tr>
<td>Surprise</td>
<td>4.69 (2.75; 3.22, 6.15)</td>
<td>4.65 (2.29; 3.47, 5.82)</td>
<td>4.17 (1.89; 3.23, 5.10)</td>
</tr>
</tbody>
</table>
Table K.2

*Study 1 Additional Analyses*

<table>
<thead>
<tr>
<th>Outcome</th>
<th>ANOVA</th>
<th>Levene's</th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affective information processing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFA</td>
<td>$F(2, 48) = .99, p = .380$</td>
<td>2, 48</td>
<td>.97</td>
<td>.385</td>
<td></td>
</tr>
<tr>
<td>PANAS-X General negative affect</td>
<td>$F(2, 48) = 0.17, p = .843$</td>
<td>2, 48</td>
<td>.83</td>
<td>.442</td>
<td></td>
</tr>
<tr>
<td>PANAS-X General positive affect</td>
<td>$F(2, 48) = 1.12, p = .335$</td>
<td>2, 48</td>
<td>.71</td>
<td>.495</td>
<td></td>
</tr>
<tr>
<td><strong>Cognitive information processing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFC</td>
<td>$F(2, 48) = 2.92, p = .064$</td>
<td>2, 47</td>
<td>.00</td>
<td>.999</td>
<td></td>
</tr>
<tr>
<td>REI: Rational ability</td>
<td>$F(2, 48) = 0.89, p = .747$</td>
<td>2, 48</td>
<td>.15</td>
<td>.860</td>
<td></td>
</tr>
<tr>
<td>REI: Rational engagement</td>
<td>$F(2, 48) = 2.33, p = .108$</td>
<td>2, 48</td>
<td>.68</td>
<td>.511</td>
<td></td>
</tr>
<tr>
<td>REI: Experiential ability</td>
<td>$F(2, 48) = 1.97, p = .151$</td>
<td>2, 48</td>
<td>.87</td>
<td>.425</td>
<td></td>
</tr>
<tr>
<td>REI: Experiential engagement</td>
<td>$F(2, 48) = 0.74, p = .485$</td>
<td>2, 48</td>
<td>.27</td>
<td>.765</td>
<td></td>
</tr>
<tr>
<td><strong>Risk perception</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal risk</td>
<td>$F(2, 48) = 0.38, p = .686$</td>
<td>2, 48</td>
<td>.02</td>
<td>.983</td>
<td></td>
</tr>
<tr>
<td>Social comparison risk</td>
<td>$F(2, 48) = 0.05, p = .954$</td>
<td>2, 48</td>
<td>.22</td>
<td>.803</td>
<td></td>
</tr>
<tr>
<td>Perceived worry</td>
<td>$F(2, 48) = 0.00, p = .997$</td>
<td>2, 48</td>
<td>1.26</td>
<td>.292</td>
<td></td>
</tr>
<tr>
<td>Perceived anxiety</td>
<td>$F(2, 48) = 1.19, p = .313$</td>
<td>2, 48</td>
<td>1.77</td>
<td>.182</td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>$F(2, 48) = 0.97, p = .388$</td>
<td>2, 48</td>
<td>.49</td>
<td>.615</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>$F(2, 48) = 0.02, p = .978$</td>
<td>2, 48</td>
<td>.93</td>
<td>.400</td>
<td></td>
</tr>
<tr>
<td>Willingness to take a test</td>
<td>$F(2, 48) = 0.73, p = .488$</td>
<td>2, 48</td>
<td>.75</td>
<td>.480</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with amount of risk information</td>
<td>$F(2, 48) = 0.64, p = .531$</td>
<td>2, 48</td>
<td>1.06</td>
<td>.355</td>
<td></td>
</tr>
<tr>
<td><strong>Risk Perception</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived severity</td>
<td>$F(2, 48) = 9.06, p &lt; .001$</td>
<td>2</td>
<td>0.57</td>
<td>.753</td>
<td></td>
</tr>
<tr>
<td>Clarity of information</td>
<td>$F(2, 48) = 3.89, p &lt; .05$</td>
<td>2</td>
<td>0.42</td>
<td>.809</td>
<td></td>
</tr>
</tbody>
</table>
Appendix L: Method and Relevant Descriptive Statistics of Additional Study

Method

Design

The following study set out to assess the influence of mood manipulation and self-affirmation on the processing and perception of a health risk. Due to the lack of findings from study 1, the study below was started as a means of accessing the mood manipulation and if the inclusion of a self-affirmation task would increase the effectiveness of the mood manipulation in relation to a health risk. However, the study was ended early due to the results of the exploratory factor analysis on the risk perception questionnaire as outlined in section 3.5.

A between-subjects design was employed with participants randomly assigned to one of four groups; a) positive mood manipulation and self-affirmation \((n = 6)\), b) positive mood manipulation and no affirmation \((n = 6)\), c) negative mood manipulation and self-affirmation \((n = 6)\), and d) negative mood manipulation and no affirmation \((n = 6)\). Participants were asked to complete a battery of self-report questionnaires to measure information processing, affective reactivity and self esteem. Participants then were asked to attend to a set of positive-affective or negative-affective images and to complete either a self-affirmation or no affirmation task. Participants were presented with information regarding CVD risk and after reading such were then asked to complete a self-report questionnaire to measure their risk perception of CVD. The study was approved by the ethics committee in the School of Psychology, Trinity College Dublin through the original ethics application and an amendment (see Appendix A).

Participants

Eligibility Criteria

Participants had to be over the age of 18 years.

Recruitment

The population for this study consisted of the student body of Trinity College Dublin. Recruitment and testing took place between February and April 2015, through an email campaign in a number of departments within the college. At the time, 16,729 students were registered with the college (12,420 undergraduate and 4,309 postgraduate). After receiving the initiation to participate, students were asked to contact the researcher if they were interested in taking part in the study. Upon
contacting the researcher, participants were given a brief summary of the study and a testing time was arranged. Junior and senior freshman on the undergraduate Psychology course received research credits for their participation. Other participants did not receive any incentive or reward for their participation. G*Power (Faul et al., 2007) analysis reveals that for ANOVA with a statistical power of 0.80 to detect a medium effect size (0.25), as being significant at the .05 level a sample of 128 participants will need to be recruited. However a sample of 128 was not reached as the design of future studies changed due to the results of additional post-hoc analyses on the data from Study 1.

**Materials**

**Images**

In order to prime a positive or negative affective mood, the same set of positive and negative affective images from the IAPS (Lang et al., 2008) that were utilised in study 1 were employed (see section 3.3.3.1). The image sets for all four groups were displayed for participants using Microsoft Office PowerPoint on a Dell Latitude E6330 laptop and a Dell E173FP 17-inch Flat Panel Display.

**Affirmation Task**

Participants were randomly assigned to either a self-affirmation or control group. Participants in the self-affirmation group were presented with a list of six values: business/economics/making money, art/music/theatre, science/pursuit of knowledge, social life/relationships, social action/helping others, and religion/spirituality (adapted from values characterised by the Allport-Vernon Study of Value; Allport, Vernon, & Lindzey, 1960). Participants were asked to rank the six values in order of importance. Participants were then asked to complete a ‘value essay’ on the value that they have ranked highest, writing a few paragraphs about why the particular value was important to them and a time when it had been particularly important for them in the past (see below). This self-affirmation task was chosen as it was in line with previous research examining the impact of affirmation tasks (Fein & Spencer, 1997; McQueen & Klein, 2006; Sherman et al., 2000). Participants in the control condition were asked to complete a self-reflective writing task, however they were asked to write about everything that they have eaten or drunk in the past 48 hours (McQueen & Klein, 2006).
**CVD Risk Information**

The same CVD risk information as that used in study 1 was presented to participants (see section 3.3.3.3).

**Measures**

Seven questionnaires were used throughout Study 2. One demographic questionnaire at the beginning of the testing session and then a battery of six questionnaires to assess information processing, affective reactivity, self affirmation and risk perception. A number of the questionnaires (demographic, health and medical history questionnaire, NFA, NFC, PANAS-X, REI-40, and the risk perception questionnaire) were similar to those that had been utilised in study 1 (see section 3.3.4).

**Rosenberg Self-Esteem Scale**

Due to the inclusion of a self-affirmation manipulation, participants were asked to complete the Rosenberg Self-Esteem scale (RSE; Rosenberg, 1965). The scale contains 10 statements in order to assess the individual’s level of self-esteem. Participants are asked to indicate on a 4-point Likert scale how much they agree or disagree with each statement (1 = Strongly agree; 4 = Strongly disagree).

**Risk Perception**

Within the risk perception questionnaire, a manipulation check item for the self-affirmation task was included to assess the effect of the self-affirmation task versus the control. Participants were asked ‘With regard the writing task you completed, how meaningful did you find the essay?’. Participants responded using a 7-point Likert scale (1 = Not at all meaningful, 7 = Very meaningful).

**Procedure**

All testing sessions took place in testing rooms within the School of Psychology in Trinity College Dublin. At the beginning of the testing session, participants were welcomed and thanked for their interest in taking part in the study. Participants were first asked to read the information sheet, they were informed of the nature of the study and reminded that they could withdraw from the study at any stage if they so wished. After reading the information sheet, participants were asked to complete the consent form if they were happy to proceed with participation and asked if they had any questions before beginning the testing session. Following this, participants were asked to complete the demographics and health questionnaire. It was stated to participants that the questionnaire contained questions relating to their health, and if they wished not to answer such questions, they were not obliged to.
After completion of the demographics and health questionnaire, participants were presented with the battery of questionnaires to be completed, including the NFA, the NFC, the REI, the PANAS-X and the RSE. The order of the questionnaires was randomised across participants. Participants were informed that the instructions for each questionnaire were included at the top of each questionnaire, but if they had any questions to ask the researcher.

After participants had indicated that they had finished completing the battery of questionnaires, they were directed towards the external monitor, which displayed the following message, ‘Please view and pay attention to the following images’. Participants were asked to pay attention to the set of images that were going to appear on the screen and were reminded that if they wanted to stop participation at any stage they were free to do so. Each image was displayed for 6 seconds (in line with IAPS procedures; Lang et al., 2008), with a half a second break in between each image (where a black fixation cross was displayed in the middle of a white screen), resulting in each set of images lasting 5 minutes and 42 seconds. Following this, participants were presented with the self-affirmation or control task. Participants were informed that the instructions for the task were at the top of the page, but if they had any questions to ask the researcher. Participants were not timed and were given as much time as was required to complete the affirmation or control tasks.

Participants were then presented with the CVD risk message. They were asked to read the CVD risk message presented on the page and informed that they would be asked to complete a questionnaire afterwards based on the CVD risk message. After participants had indicated that they had finished reading the CVD risk message, they were asked to complete the risk perception questionnaire. Once participants have completed the risk perception questionnaire, they were debriefed, thanked for their participation, and asked if they have any further questions relating to the study.

Results

Sample Characteristics

26 participants contacted the researcher and 24 participants took part in the study and completed each section. Two participants were lost as they were no longer contactable or as they declined to participate while a testing session was being arranged. Participants were randomly allocated to one of four groups: 1) positive affective and self-affirmation (n = 6); 2) negative affective and self-affirmation (n = 6); and 3) positive affective and no affirmation (n = 6); and 4) negative affective and no
affirmation \( (n = 6) \). Demographic characteristics and health information for the sample are summarised in Table L.1 and L.2, with data split across the four groups. Within the whole sample, there were 13 males and 11 females and the mean age was 28.38 (SD = 13.76; 95% CI: 22.57 – 34.18). The majority of the sample identified their nationality as Irish: Irish = 22 (91.7%), non-Irish = 2 (8.3%). 19 (79.2%) participants were single, 3 (12.5%) were married, 1 (4.2%) was living with partner as if married and 1 (4.2%) participant was divorced. For level of education completed, 15 (62.5%) of participants had up to secondary level education and 9 (37.5%) participants had completed some form of third level education. 12 (50%) participants stated that they were full-time students, 5 (20.8%) were working full-time, 1 (4.2%) was retired, and 6 (25%) stated that they were full-time students and working part-time at the same time.
Table L.1

Demographic characteristics for sample

<table>
<thead>
<tr>
<th>Demographics</th>
<th>PA(^a) + Self-Affirm. (n = 6)</th>
<th>NA(^b) + Self-Affirm. (n = 6)</th>
<th>PA(^a) + No Affirm. (n = 6)</th>
<th>NA(^b) + No Affirm. (n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%) M (SD; 95% CI)</td>
<td>n (%) M (SD; 95% CI)</td>
<td>n (%) M (SD; 95% CI)</td>
<td>n (%) M (SD; 95% CI)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>28.50 (13.55; 14.28, 42.72)</td>
<td>28.17 (21.00; 6.13, 50.20)</td>
<td>30.83 (12.77; 17.44, 44.23)</td>
<td>26.00 (8.32; 17.27, 34.73)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4 (66.7%) 2 (33.3%)</td>
<td>6 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2 (33.3%) 4 (66.7%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irish</td>
<td>5 (83.3%) 6 (100%)</td>
<td>6 (100%)</td>
<td>5 (83.3%)</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td>Non-Irish</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>-</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>5 (83.3%) 4 (66.7%)</td>
<td>4 (66.7%)</td>
<td>6 (100%)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>1 (16.7%) 1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Living with partner as</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>if married</td>
<td>- 1 (16.7%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Divorced</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Education Completed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary level</td>
<td>3 (50%) 5 (83.3%)</td>
<td>3 (50%)</td>
<td>4 (66.7%)</td>
<td></td>
</tr>
<tr>
<td>Third level</td>
<td>3 (50%) 1 (16.7%)</td>
<td>3 (50%)</td>
<td>2 (33.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Employed Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>4 (66.7%) 4 (66.7%)</td>
<td>3 (50%)</td>
<td>1 (16.7%)</td>
<td></td>
</tr>
<tr>
<td>Full-time employed</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>2 (33.3%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>Student + Part-time</td>
<td>1 (16.7%) 1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>employed</td>
<td>-</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\)Positive Affective  
\(^b\)Negative Affective
Table L.2

Health information for sample (n per group = 6)

<table>
<thead>
<tr>
<th>Health Information</th>
<th>PA&lt;sup&gt;a&lt;/sup&gt; + Self-Affirmation n (%)</th>
<th>NA&lt;sup&gt;b&lt;/sup&gt; + Self-Affirmation n (%)</th>
<th>PA&lt;sup&gt;a&lt;/sup&gt; + No Affirmation n (%)</th>
<th>NA&lt;sup&gt;b&lt;/sup&gt; + No Affirmation n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD: Personal History</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No</td>
<td>6 (100%)</td>
<td>5 (83.3%)</td>
<td>6 (100%)</td>
<td>6 (100%)</td>
</tr>
<tr>
<td>CVD: Family History</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2 (33.3%)</td>
<td>2 (33.3%)</td>
<td>2 (33.3%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>No</td>
<td>4 (66.7%)</td>
<td>4 (66.7%)</td>
<td>4 (66.7%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>On-going Health Issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>No</td>
<td>6 (100%)</td>
<td>5 (83.3%)</td>
<td>5 (83.3%)</td>
<td>4 (66.7%)</td>
</tr>
<tr>
<td>Depression/Anxiety&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>2 (33.3%)</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td>No</td>
<td>6 (100%)</td>
<td>4 (66.7%)</td>
<td>5 (83.3%)</td>
<td>5 (83.3%)</td>
</tr>
<tr>
<td>Eating Habits&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t pay attention</td>
<td>2 (33.3%)</td>
<td>-</td>
<td>-</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>Healthy diet…feel guilty</td>
<td>-</td>
<td>2 (33.3%)</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td>Usually watch what I eat</td>
<td>4 (66.7%)</td>
<td>3 (50%)</td>
<td>5 (83.3%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>Always watch what I eat</td>
<td>-</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Exercise&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For the suggested amount</td>
<td>1 (16.7%)</td>
<td>3 (50%)</td>
<td>1 (16.7%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>Less than the suggested…</td>
<td>3 (50%)</td>
<td>2 (33.3%)</td>
<td>3 (50%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>More than the suggested…</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>2 (33.3%)</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td>Do not exercise</td>
<td>1 (16.7%)</td>
<td>-</td>
<td>-</td>
<td>1 (16.7%)</td>
</tr>
<tr>
<td>Alcohol Consumption&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drink the suggested amount</td>
<td>-</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>-</td>
</tr>
<tr>
<td>Drink more than…</td>
<td>2 (33.3%)</td>
<td>2 (33.3%)</td>
<td>1 (16.7%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>Drink less than…</td>
<td>4 (66.7%)</td>
<td>2 (33.3%)</td>
<td>3 (50%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>Do not drink alcohol</td>
<td>-</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>-</td>
</tr>
<tr>
<td>Smoking Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>1 (16.7%)</td>
<td>-</td>
</tr>
<tr>
<td>Never smoked</td>
<td>4 (66.7%)</td>
<td>4 (66.7%)</td>
<td>4 (66.7%)</td>
<td>4 (66.7%)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Positive Affective  
<sup>b</sup>Negative Affective  
<sup>c</sup>For full item descriptions and the suggested amounts of exercise and alcohol consumption see appendix H.
### Descriptive Statistics

Descriptive statistics for the risk perception measures that were included in the exploratory factor analysis in section 3.5 are presented in Table L.3, with the data split across the four affective and affirmation groups.

Table L.3

<table>
<thead>
<tr>
<th>Risk Perception Measures</th>
<th>PA^a + Self-Affirm.</th>
<th>NA^b + Self-Affirm.</th>
<th>PA^a + No Affirm.</th>
<th>NA^b + No Affirm.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
</tr>
<tr>
<td>Personal risk</td>
<td>4.67 (0.82; 3.81, 5.52)</td>
<td>4.06 (0.94; 3.62, 5.38)</td>
<td>4.83 (1.72; 3.03, 6.64)</td>
<td>3.81 (1.52; 1.95, 5.38)</td>
</tr>
<tr>
<td>Social comparison risk</td>
<td>6.00 (0.89; 5.00, 7.00)</td>
<td>5.00 (0.94; 4.06, 6.06)</td>
<td>5.33 (0.82; 4.48, 6.19)</td>
<td>4.06 (0.94; 4.48, 6.19)</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>5.79 (0.88; 6.50, 7.00)</td>
<td>3.83 (1.57; 2.94, 4.94)</td>
<td>5.13 (1.72; 4.48, 6.19)</td>
<td>4.17 (1.57; 3.29, 5.00)</td>
</tr>
<tr>
<td>Perceived worry</td>
<td>3.83 (1.47; 2.94, 4.94)</td>
<td>2.29 (0.31; 1.91, 2.62)</td>
<td>2.32 (0.68; 1.82, 2.68)</td>
<td>2.94 (0.31; 2.32, 3.56)</td>
</tr>
<tr>
<td>Perceived anxiety</td>
<td>6.67 (0.52; 6.50, 7.00)</td>
<td>2.00 (1.0; 1.04, 2.04)</td>
<td>6.33 (0.52; 6.17, 7.00)</td>
<td>0.85 (0.31; 0.85, 1.30)</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>6.12 (0.71; 5.93, 7.00)</td>
<td>6.33 (0.52; 6.17, 7.00)</td>
<td>5.79 (0.61; 5.62, 6.96)</td>
<td>6.33 (0.52; 5.79, 6.88)</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>6.33 (0.52; 6.17, 7.00)</td>
<td>6.33 (0.52; 5.79, 6.88)</td>
<td>6.00 (0.60; 5.34, 6.66)</td>
<td>6.00 (1.10; 4.85, 7.15)</td>
</tr>
<tr>
<td>Willingness to take a test</td>
<td>5.67 (0.52; 5.33, 6.00)</td>
<td>6.50 (0.55; 6.33, 6.63)</td>
<td>5.83 (0.17; 4.61, 7.06)</td>
<td>5.83 (0.17; 5.83, 6.83)</td>
</tr>
<tr>
<td>Attention to future symptoms</td>
<td>5.33 (0.82; 5.50, 6.00)</td>
<td>5.93 (0.70; 6.40, 7.26)</td>
<td>5.17 (0.17; 4.61, 7.06)</td>
<td>5.17 (0.17; 4.61, 7.06)</td>
</tr>
<tr>
<td>Clarity of information</td>
<td>6.33 (1.21; 6.33, 7.33)</td>
<td>6.33 (1.21; 5.83, 6.83)</td>
<td>5.83 (0.17; 4.61, 7.06)</td>
<td>5.83 (0.17; 4.61, 7.06)</td>
</tr>
<tr>
<td>Understanding of risk information</td>
<td>6.17 (0.75; 5.83, 6.50)</td>
<td>5.06 (0.76; 5.06, 7.00)</td>
<td>5.67 (0.17; 4.61, 7.06)</td>
<td>5.67 (0.17; 4.61, 7.06)</td>
</tr>
<tr>
<td>Satisfaction with amount of risk</td>
<td>6.00 (0.63; 6.00, 7.00)</td>
<td>5.33 (0.66; 4.85, 7.15)</td>
<td>5.50 (0.15; 3.91, 7.09)</td>
<td>5.33 (0.15; 3.91, 7.09)</td>
</tr>
</tbody>
</table>

^aPositive Affective
^bNegative Affective
Appendix M: EPPM-based CVD Risk Messages (Study 2)

High Threat, High Efficacy EPPM CVD Message
Please read and consider the following health information about cardiovascular disease:

Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland and is a serious health concern for Irish people. In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due to heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases. This is more than all cancers combined and many people are worried about the dangers of cardiovascular disease.

1 in 4 people will die from heart disease or stroke in Ireland. This makes heart disease the biggest killer in Ireland. Many of these deaths were premature because those people were not aware they had heart disease, which they could have identified early and learned to manage well over time. A heart attack is often a failure of prevention that has been building up for many years, as heart disease is progressive and worsens over time. The personal burden of heart failure is great, with patients experiencing high levels of physical, functional and emotional distress. Life expectancy for patients with chronic heart failure has been shown to be poorer than for most of the common cancers.

Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes. Almost two-thirds of middle-aged and older adults in Ireland have at least 2 of 4 key risk factors for cardiovascular disease – raised blood pressure, raised cholesterol, obesity and smoking.

However, preventing cardiovascular disease can be extremely easy and there are many things you can do to protect yourself against cardiovascular disease. It’s been shown that following the guidelines below can significantly reduce your chances of developing cardiovascular disease:

- Maintaining a health body weight
- Healthy eating and physical activity
- Reducing salt intake
- Refraining from or quitting smoking
- Consuming alcohol responsibly

In Ireland, over half of the adult population have an unhealthy body weight. The prevalence of overweight individuals and obesity is high and increasing all the time. Obesity is one of the main drivers of cardiovascular disease through its effects on blood pressure, blood cholesterol and risk of Type 2 diabetes. Obesity is a serious and life-threatening condition, and can significant decrease an individual’s life expectancy. It is important to ensure a balance between nutrition and physical activity in order to
maintain a healthy weight, and among Irish adults, there has been an increase in the recommended consumption of 5 portions of fruit and vegetables a day over the past decade.

Alcohol consumption is over 40% higher than the EU average, with substantial numbers of the general public reporting excessive or risky drinking, or both. Additionally, smoking is the leading cause of preventable mortality, with Ireland ranking 2nd highest for smoking-related causes of death in Europe. While the smoking ban in the workplace introduced in 2005 has significantly reduced exposure to secondary smoke, smoking rates for adults are still high – at 29% (31% of men and 27% of women). Encouragingly, it’s been found that almost 10% of smokers are actively trying to quit and that 6 out of 10 households do not permit smoking on any occasion in their own homes. Research has shown that smokers who quit reduce their risk of getting heart disease to roughly that of non-smokers.

Levels of physical activity among the population are inadequate. Over one-fifth of Irish adults (22%) reported being completely physically inactive, with lack of interest or ‘no time’ given as the main reasons. Although a reassuring survey in 2007 found that more than half (55%) of over 10,000 Irish adults did report being physically active for a minimum of 20 minutes more than 2-3 times per week. Physical activity strengthens your heart and improves your cardiovascular system. Engaging in regular physical activity has been shown to be an effective method of managing body weight and decreasing your risk of cardiovascular disease. Physical activity prevents heart disease by controlling your blood pressure and blood cholesterol levels, reducing your stress levels, and increasing your energy. To achieve health benefits from physical activity, adults should meet or exceed taking part in at least 30 minutes of moderate intensity activity, 5 days a week. Meeting the physical activity recommended guidelines can be a large time commitment and at times may be difficult to complete, but research has shown that if you follow these simple guidelines, you can drastically reduce your chances of getting cardiovascular disease.
High Threat, Low Efficacy EPPM CVD Message

Please read and consider the following health information about cardiovascular disease:

Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland and is a serious health concern for Irish people. In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due to heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases. This is more than all cancers combined and many people are worried about the dangers of cardiovascular disease.

1 in 4 people will die from heart disease or stroke in Ireland. This makes heart disease the biggest killer in Ireland. Many of these deaths were premature because those people were not aware they had heart disease, which they could have identified early and learned to manage well over time. A heart attack is often a failure of prevention that has been building up for many years, as heart disease is progressive and worsens over time. The personal burden of heart failure is great, with patients experiencing high levels of physical, functional and emotional distress. Life expectancy for patients with chronic heart failure has been shown to be poorer than for most of the common cancers.

Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes. Almost two-thirds of middle-aged and older adults in Ireland have at least 2 of 4 key risk factors for cardiovascular disease – raised blood pressure, raised cholesterol, obesity and smoking.

But nowadays we can do something about preventing cardiovascular disease. By following the guidelines below you may reduce your chances of developing cardiovascular disease:

- Maintaining a health body weight
- Health eating and physical activity
- Reducing salt intake
- Refraining from or quitting smoking
- Consuming alcohol responsibly

In Ireland, over half of the adult population have an unhealthy body weight. The prevalence of overweight individuals and obesity is high and increasing all the time. Obesity is one of the main drivers of cardiovascular disease through its effects on blood pressure, blood cholesterol and risk of Type 2 diabetes. It is important to ensure a balance between nutrition and physical activity in order to maintain a healthy weight.

Alcohol consumption is over 40% higher than the EU average, with substantial numbers of the general public reporting excessive or risky drinking, or both. Additionally, smoking is the leading cause of preventable mortality, with Ireland
ranking 2nd highest for smoking-related causes of death in Europe. While the smoking ban in the workplace introduced in 2005 has significantly reduced exposure to secondary smoke, smoking rates for adults are still high – at 29% (31% of men and 27% of women).

Levels of physical activity among the population are inadequate. Over one-fifth of Irish adults (22%) reported being completely physically inactive, with lack of interest or ‘no time’ given as the main reasons. Although a reassuring survey in 2007 found that more than half (55%) of over 10,000 Irish adults did report being physically active for a minimum of 20 minutes more than 2-3 times per week. Physical activity strengthens your heart and improves your cardiovascular system. By engaging in regular physical activity, there is a chance that you may reduce your risk of cardiovascular disease.
Low Threat, High Efficacy EPPM CVD Message

Please read and consider the following health information about cardiovascular disease:

Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the most prevalent cause of death in Ireland. In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases.

1 in 4 people will die from heart disease or stroke in Ireland. This equates to approximately 10,000 people in Ireland who will die each year from a heart attack, stroke or other associated conditions.

Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes. Almost two-thirds of middle-aged and older adults in Ireland have at least 2 of 4 key risk factors for cardiovascular disease – raised blood pressure, raised cholesterol, obesity and smoking.

However, preventing cardiovascular disease can be extremely easy and there are many things you can do to protect yourself against cardiovascular disease. It’s been shown that following the guidelines below can significantly reduce your chances of developing cardiovascular disease:

- Maintaining a health body weight
- Healthy eating and physical activity
- Reducing salt intake
- Refraining from or quitting smoking
- Consuming alcohol responsibly

In Ireland, over half of the adult population have an unhealthy body weight. The prevalence of overweight individuals and obesity is high and increasing all the time. Obesity is one of the main drivers of cardiovascular disease through its effects on blood pressure, blood cholesterol and risk of Type 2 diabetes. Obesity is a serious and life-threatening condition, and can significant decrease an individual’s life expectancy. It is important to ensure a balance between nutrition and physical activity in order to maintain a healthy weight, and among Irish adults, there has been an increase in the recommended consumption of 5 portions of fruit and vegetables a day over the past decade.

Alcohol consumption is over 40% higher than the EU average, with substantial numbers of the general public reporting excessive or risky drinking, or both. Additionally, smoking is the leading cause of preventable mortality, with Ireland ranking 2nd highest for smoking-related causes of death in Europe. While the smoking ban in the workplace introduced in 2005 has significantly reduced exposure to
secondary smoke, smoking rates for adults are still high – at 29% (31% of men and 27% of women). Encouragingly, it’s been found that almost 10% of smokers are actively trying to quit and that 6 out of 10 households do not permit smoking on any occasion in their own homes. Research has shown that smokers who quit reduce their risk of getting heart disease to roughly that of non-smokers.

Levels of physical activity among the population are inadequate. Over one-fifth of Irish adults (22%) reported being completely physically inactive, with lack of interest or ‘no time’ given as the main reasons. Although a reassuring survey in 2007 found that more than half (55%) of over 10,000 Irish adults did report being physically active for a minimum of 20 minutes more than 2-3 times per week. Physical activity strengthens your heart and improves your cardiovascular system. Engaging in regular physical activity has been shown to be an effective method of managing body weight and decreasing your risk of cardiovascular disease. Physical activity prevents heart disease by controlling your blood pressure and blood cholesterol levels, reducing your stress levels, and increasing your energy. To achieve health benefits from physical activity, adults should meet or exceed taking part in at least 30 minutes of moderate intensity activity, 5 days a week. Meeting the physical activity recommended guidelines can be a large time commitment and at times may be difficult to complete, but research has shown that if you follow these simple guidelines, you can drastically reduce your chances of getting cardiovascular disease.
Low Threat, Low Efficacy EPPM CVD Message

Please read and consider the following health information about cardiovascular disease:

Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the most prevalent cause of death in Ireland. In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases. 1 in 4 people will die from heart disease or stroke in Ireland. This equates to approximately 10,000 people in Ireland who will die each year from a heart attack, stroke or other associated conditions.

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Alcohol consumption is over 40% higher than the EU average, with substantial numbers of the general public reporting excessive or risky drinking, or both. Additionally, smoking is the leading cause of preventable mortality, with Ireland ranking 2nd highest for smoking-related causes of death in Europe. While the smoking ban in the workplace introduced in 2005 has significantly reduced exposure to secondary smoke, smoking rates for adults are still high – at 29% (31% of men and 27% of women).

Levels of physical activity among the population are inadequate. Over one-fifth of Irish adults (22%) reported being completely physically inactive, with lack of interest or ‘no time’ given as the main reasons. Although a reassuring survey in 2007 found that more
than half (55%) of over 10,000 Irish adults did report being physically active for a minimum of 20 minutes more than 2-3 times per week. Physical activity strengthens your heart and improves your cardiovascular system. By engaging in regular physical activity, there is a chance that you may reduce your risk of cardiovascular disease.
Appendix N: Risk Behaviour Diagnosis Scale (Study 2)

After reading the health information, please complete each of the following questions, using the associated scales. Circle the number that best describes your answer for each question. The following questions ask you about your thoughts and feelings towards cardiovascular disease after reading the health information you’ve just received.

1. **I am at risk for getting cardiovascular disease at some stage in my life.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7

2. **It is possible that I will get cardiovascular disease at some stage in my life.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7

3. **I am susceptible to cardiovascular disease.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7

4. **Cardiovascular disease is a serious health condition.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7

5. **Cardiovascular disease is extremely harmful.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7

6. **Cardiovascular disease is a severe health problem.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7

The following questions ask you about your thoughts, feelings and intentions towards some of the lifestyle factors associated with cardiovascular disease that were included in the health information you’ve just received.

*Smoking*

7. **RefRAINING from or quitting smoking prevents cardiovascular disease.**
   Strongly Disagree Strongly Agree
   1 2 3 4 5 6 7
8. Refraining from or quitting smoking works in deterring cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7

9. Refraining from or quitting smoking is effective in getting rid of cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7

10. I am able to refrain from or quit smoking to prevent cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7

11. It is easy to refrain from or quit smoking to prevent cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7

12. I can refrain from or quit smoking to prevent cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7

13. If you do smoke, do you intend to stop smoking in the next month?

Definitely no                   Definitely yes
1  2  3  4  5  6  7

14. If you do smoke, how likely is it that you will stop smoking in the next month?

Extremely unlikely             Extremely likely
1  2  3  4  5  6  7

Eating healthily

15. Eating healthily prevents cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7


Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7

17. Eating healthily is effective in getting rid of cardiovascular disease.

Strongly Disagree               Strongly Agree
1  2  3  4  5  6  7
18. I am able to eat healthily to prevent cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
19. It is easy to eat healthily to prevent cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
20. I can eat healthily to prevent cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
21. Do you intend to eat healthily in the next month?
Definitely no  Definitely yes
1  2  3  4  5  6  7
22. How likely is it that you will eat healthily in the next month?
Extremely unlikely  Extremely likely
1  2  3  4  5  6  7

Physical Activity
23. Being physical active prevents cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
24. Being physical active works in deterring cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
25. Being physical active is effective in getting rid of cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
26. I am able to exercise to prevent cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
27. It is easy to exercise to prevent cardiovascular disease.
Strongly Disagree  Strongly Agree
1  2  3  4  5  6  7
28. I can exercise to prevent cardiovascular disease.
Strongly Disagree  Strongly Agree
29. Do you intend to exercise in the next month?

Definitely no                       Definitely yes

30. How likely is it that you will exercise in the next month?

The following questions ask you about your thoughts and feelings towards the health information about cardiovascular disease you’ve just received.

31. When I read the message about cardiovascular disease, my first reaction was that I did not want to think about cardiovascular disease.

Strongly Disagree                       Strongly Agree

32. The information about cardiovascular disease was exaggerated.

Not at all                             Very much

33. The information about cardiovascular disease was overblown.

Not at all                             Very much

34. The information about cardiovascular disease tried to manipulate my feelings.

Strongly Disagree                       Strongly Agree

35. The information about cardiovascular disease tried to strain the truth.

Strongly Disagree                       Strongly Agree
Appendix O: Participant Information & Debriefing Sheet for Study 2

Information Sheet
You are being invited to take part in a research study in the School of Psychology, TCD that aims to investigate decision-making and health information.

What will happen to me if I take part?
If you decide to take part in this study, you will first be asked to complete a questionnaire providing some information about yourself, your lifestyle and your health. You will then be asked to read some health information. After reading the health information, you will be asked to complete a questionnaire relating to your thoughts and feelings towards the health information. If at any stage you feel uncomfortable with the health information or any of the questions being asked, you are free to not answer the question or withdraw from the study at any time without giving a reason. Additionally, there will be information provided for health, information and counselling services should you have any questions relating to some of the issues raised in this study. The researchers contact information will also be provided should you have any further questions.

How long will my part in the study last?
The study will take approx. 25mins to complete.

What are my rights if I join the study?
Participation in the study is entirely voluntary and if you agree to participate you have the following rights:

1. The information from this study will be kept strictly confidential and will not be made available to any other people.
2. We will aim to publish our results in scientific journals but any information we have will be completely anonymous and presented as a group.
3. As participation is completely voluntary, you are free to withdraw from the study at any time. You are also free to withdraw your data at the conclusion of your participation should you so wish.

Sinéad Moylett, School of Psychology, Áras an Phiarsaigh, Trinity College Dublin, Dublin 2.
01 8963083 moyletts@tcd.ie

Prof. David Hevey School of Psychology, Áras an Phiarsaigh, Trinity College Dublin, Dublin 2.
01 8962406 heveydt@tcd.ie
Debriefing Sheet

What is the study?
Thank you for taking part in this study. Hopefully you enjoyed the experience. The data collected during this study will be used to investigate decision-making and health information.

Who do I contact for more information or if I have further concerns?
If you have any questions about your participation, please feel free to contact the researchers:

Sinéad Moylett  
School of Psychology,  
Áras an Piarsaigh,  
Trinity College Dublin,  
Dublin 2.  
01 8963083  
moyletts@tcd.ie

Prof. David Hevey  
School of Psychology,  
Áras an Piarsaigh  
Trinity College Dublin,  
Dublin 2.  
01 8962406  
heveydt@tcd.ie

If you would like to talk to someone about any of the health issues raised in this study, please contact your local health service or GP. For students of TCD, you can contact the College Health Centre at 01 8961591 or 01 8961556. If you would like more information about heart healthy lifestyles or cardiovascular disease, please see http://ihda.ie/ and http://www.irishheart.ie.

If you would like to talk to someone about any of the topics raised in this study, The Samaritans and Aware both provide confidential services. The Samaritans can be contacted on 1850 60 90 90 or jo@samaritans.org. Aware can be contacted on 01 661 7211 or info@aware.ie.

Thank you!
Appendix P: Additional Descriptive Statistics from the RBD Scale (Study 2)

Table P.1

Descriptive statistics for individual measures of CVD threat from the RBD scale

<table>
<thead>
<tr>
<th>RBD Scale: CVD Threat Measures</th>
<th>HT + HE$^a$ (n = 64)</th>
<th>HT + LE$^a$ (n = 61)</th>
<th>LT + HE$^a$ (n = 69)</th>
<th>LT + LE$^a$ (n = 74)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (SD; 95% CI)</td>
<td>$M$ (SD; 95% CI)</td>
<td>$M$ (SD; 95% CI)</td>
<td>$M$ (SD; 95% CI)</td>
</tr>
<tr>
<td>Susceptibility 1: Personal risk</td>
<td>4.14 (1.83; 3.68, 4.60)</td>
<td>4.31 (1.63; 3.89, 4.73)</td>
<td>4.42 (1.70; 4.12, 4.94)</td>
<td>4.53 (1.77; 4.12, 4.94)</td>
</tr>
<tr>
<td>Susceptibility 2: Personal susceptibility</td>
<td>3.68, 4.60</td>
<td>3.89, 4.73</td>
<td>4.01, 4.83</td>
<td>4.12, 4.94</td>
</tr>
<tr>
<td>Severity 1: Harmful</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
</tr>
<tr>
<td>Severity 2: Personal severity</td>
<td>6.00 – 7.00</td>
<td>6.00 – 7.00</td>
<td>6.00 – 7.00</td>
<td>6.00 – 7.00</td>
</tr>
</tbody>
</table>

$^a$HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy
Table P.2

*Descriptive statistics for individual measures of health behaviour efficacy from the RBD scale*

<table>
<thead>
<tr>
<th>RBD Scale: Health Behaviour Efficacy Measures</th>
<th>HT + HE(^a) Mdn (IQR(^b))</th>
<th>HT + LE(^a) Mdn (IQR)</th>
<th>LT + HE(^a) Mdn (IQR)</th>
<th>LT + LE(^a) Mdn (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>n = 60</td>
<td>n = 56</td>
<td>n = 67</td>
<td>n = 74</td>
</tr>
<tr>
<td>Response efficacy 1 (prevents)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (4.25 – 7.00)</td>
<td>6.00 (3.00 – 7.00)</td>
<td>5.00 (3.75 – 7.00)</td>
</tr>
<tr>
<td>Response efficacy 2 (deters)</td>
<td>7.00 (5.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
</tr>
<tr>
<td>Self-efficacy 1 (I am able…)</td>
<td>7.00 (5.25 – 7.00)</td>
<td>7.00 (4.25 – 7.00)</td>
<td>7.00 (5.00 – 7.00)</td>
<td>7.00 (4.00 – 7.00)</td>
</tr>
<tr>
<td>Self-efficacy 2 (It is easy to…)</td>
<td>3.50 (2.00 – 6.00)</td>
<td>3.00 (2.00 – 7.00)</td>
<td>4.00 (2.00 – 6.00)</td>
<td>3.00 (2.00 – 5.00)</td>
</tr>
<tr>
<td>n = 59</td>
<td></td>
<td>n = 56</td>
<td>n = 66</td>
<td>n = 70</td>
</tr>
<tr>
<td>Eating Healthily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy 1 (prevents)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 6.25)</td>
</tr>
<tr>
<td>Response efficacy 2 (deters)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
</tr>
<tr>
<td>Self-efficacy 1 (I am able…)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 6.25)</td>
</tr>
<tr>
<td>Self-efficacy 2 (It is easy to…)</td>
<td>5.00 (4.00 – 6.00)</td>
<td>5.00 (3.00 – 6.00)</td>
<td>5.00 (3.00 – 6.00)</td>
<td>5.00 (3.00 – 6.00)</td>
</tr>
<tr>
<td>n = 57</td>
<td></td>
<td>n = 56</td>
<td>n = 66</td>
<td>n = 70</td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy 1 (prevents)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
</tr>
<tr>
<td>Response efficacy 2 (deters)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
</tr>
<tr>
<td>Self-efficacy 1 (I am able…)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
<td>6.00 (5.00 – 7.00)</td>
</tr>
<tr>
<td>Self-efficacy 2 (It is easy to…)</td>
<td>5.00 (5.00 – 6.00)</td>
<td>6.00 (4.00 – 7.00)</td>
<td>5.00 (5.00 – 6.00)</td>
<td>5.00 (4.00 – 6.00)</td>
</tr>
</tbody>
</table>

\(^a\)HT = High Threat, LT = Low Threat, HE = High Efficacy, LE = Low Efficacy

\(^b\)Interquartile Range
Appendix Q: Additional Chi-squares Analyses (Study 2)

A chi-square test was carried out to see if there was an association between the CVD risk information groups and danger/fear-control processes in terms of eating healthily. No significant association was found between the EPPM CVD risk information groups and whether participants were partaking in danger- or fear-control processes, $\chi^2(3, 251) = 2.95, p = .399$. See Table Q.1 for breakdown of participants per group.

Table Q.1

<table>
<thead>
<tr>
<th>EPPM CVD Message Group</th>
<th>Control processes (Eating Healthily)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Danger-control</td>
<td>Fear-control</td>
</tr>
<tr>
<td>High threat, high efficacy</td>
<td>33 (13.1%)</td>
<td>26 (10.4%)</td>
</tr>
<tr>
<td>High threat, low efficacy</td>
<td>31 (12.4%)</td>
<td>25 (10%)</td>
</tr>
<tr>
<td>Low threat, high efficacy</td>
<td>28 (11.2%)</td>
<td>38 (15.1%)</td>
</tr>
<tr>
<td>Low threat, low efficacy</td>
<td>35 (13.9%)</td>
<td>35 (13.9%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>127 (50.6%)</td>
<td>124 (49.4%)</td>
</tr>
</tbody>
</table>

A chi-square test was carried out to see if there was an association between the CVD risk information groups and danger/fear-control processes in terms of physical activity. It was found that there was no significant association between the CVD risk information groups and whether participants were partaking in danger- or fear-control processes, $\chi^2(3, 249) = 1.16, p = .763$. See Table Q.2 for breakdown of participants per group.

Table Q.2

<table>
<thead>
<tr>
<th>EPPM CVD Message Group</th>
<th>Control processes (Physical Activity)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Danger-control</td>
<td>Fear-control</td>
</tr>
<tr>
<td>High threat, high efficacy</td>
<td>34 (13.7%)</td>
<td>23 (9.2%)</td>
</tr>
<tr>
<td>High threat, low efficacy</td>
<td>29 (11.6%)</td>
<td>27 (10.8%)</td>
</tr>
<tr>
<td>Low threat, high efficacy</td>
<td>34 (13.7%)</td>
<td>32 (12.9%)</td>
</tr>
<tr>
<td>Low threat, low efficacy</td>
<td>36 (14.5%)</td>
<td>34 (13.7%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>133 (53.4%)</td>
<td>116 (46.6%)</td>
</tr>
</tbody>
</table>
### Appendix R: Additional Analyses (Study 2)

<table>
<thead>
<tr>
<th>RBD Scale Measure</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Levene's</td>
</tr>
<tr>
<td><strong>CVD Threat Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Perceived susceptibility*</td>
<td>F = 0.57, p = .636</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>F = 1.64, p = .181</td>
</tr>
<tr>
<td>Social comparison risk*</td>
<td>F = 0.75, p = .523</td>
</tr>
<tr>
<td>Social comparison severity</td>
<td>F = 1.26, p = .289</td>
</tr>
<tr>
<td><strong>Smoking Efficacy Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>F = 0.08, p = .973</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>F = 1.02, p = .385</td>
</tr>
<tr>
<td>Behavioural intentions*</td>
<td>F = 0.65, p = .587</td>
</tr>
<tr>
<td>Behavioural likelihood*</td>
<td>F = 0.48, p = .696</td>
</tr>
<tr>
<td><strong>Eating Healthy</strong></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>F = 1.90, p = .131</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>F = 2.13, p = .098</td>
</tr>
<tr>
<td>Behavioural intentions</td>
<td>F = 1.23, p = .298</td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>F = 2.29, p = .079</td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
</tr>
<tr>
<td>Perceived efficacy</td>
<td>F = 2.16, p = .909</td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>F = 0.45, p = .720</td>
</tr>
<tr>
<td><strong>Message Derogation</strong></td>
<td></td>
</tr>
<tr>
<td>Initial reaction to CVD info.*</td>
<td>F = 0.63, p = .599</td>
</tr>
<tr>
<td>Exaggerated in formation</td>
<td>F = 2.02, p = .111</td>
</tr>
<tr>
<td>Manipulation of feelings</td>
<td>F = 0.84, p = .473</td>
</tr>
<tr>
<td>Tried to strain the truth</td>
<td>F = 0.65, p = .586</td>
</tr>
</tbody>
</table>

\*Data was not transformed
Appendix S: EPPM Threat-to-Efficacy Ratio Messages (Study 3)

1/1 Ratio (“Standard message”)

Please read and consider the following health information about cardiovascular disease:

Men and women over the age of 60 years are susceptible to cardiovascular disease (CVD).
- Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland, with 1 in 4 people dying from heart disease or stroke.

Cardiovascular disease, as well as causing death, has serious health consequences.
- Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes.

Preventing CVD can be extremely easy.
- Maintaining a healthy body weight, eating healthily, taking part in physical activity, reducing salt intake, refraining from or quitting smoking and consuming alcohol responsibly can all significantly reduce the chance of getting cardiovascular disease.

There are many things you can do to protect yourself against cardiovascular disease.
- You can control your risk of heart disease by following a heart-healthy lifestyle through maintaining the following five healthy lifestyle habits:
  1. Eating a healthy diet
  2. Being physically active
  3. Limiting your alcohol intake
  4. No smoking
  5. Managing and coping with stress
1/0 Ratio ("Low efficacy")

Please read and consider the following health information about cardiovascular disease:

Men and women over the age of 60 years are susceptible to cardiovascular disease (CVD).

- Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland, with 1 in 4 people dying from heart disease or stroke.

Cardiovascular disease, as well as causing death, has serious health consequences.

- Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes.
0/1 Ratio ("Low threat")

Please read and consider the following health information about cardiovascular disease:

*Preventing CVD can be extremely easy.*

- Maintaining a healthy body weight, eating healthily, taking part in physical activity, reducing salt intake, refraining from or quitting smoking and consuming alcohol responsibly can all significantly reduce the chance of getting cardiovascular disease.

*There are many things you can do to protect yourself against cardiovascular disease.*

- You can control your risk of heart disease by following a heart-healthy lifestyle through maintaining the following five healthy lifestyle habits:
  1. Eating a healthy diet
  2. Being physically active
  3. Limiting your alcohol intake
  4. No smoking
  5. Managing and coping with stress
Please read and consider the following health information about cardiovascular disease:

Men and women over the age of 60 years are susceptible to cardiovascular disease (CVD).

- Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland, with 1 in 4 people dying from heart disease or stroke.

Cardiovascular disease, as well as causing death, has serious health consequences.

- Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes.

Preventing CVD can be extremely easy.

- Maintaining a healthy body weight, eating healthily, taking part in physical activity, reducing salt intake, refraining from or quitting smoking and consuming alcohol responsibly can all significantly reduce the chance of getting cardiovascular disease.

- Many of the deaths caused by cardiovascular disease were premature because those people were not aware they had heart disease, which could have identified early and learned to manage well over time. Past research has found that 90% of heart disease cases are completely preventable by modifying diet and lifestyle factors.

There are many things you can do to protect yourself against cardiovascular disease.

- You can control your risk of heart disease by following a heart-healthy lifestyle through maintaining the following five healthy lifestyle habits:
  1. Eating a healthy diet
  2. Being physically active
  3. Limiting your alcohol intake
  4. No smoking
  5. Managing and coping with stress

- No matter what your age, you can take matters into your own hands to help reduce your risk of cardiovascular disease. You’re never too young – or too old – to take care of your heart. Even small, basic steps based on the five healthy lifestyle habits above can go a long way toward reducing your risk of heart disease.
Please read and consider the following health information about cardiovascular disease:

*Men and women over the age of 60 years are susceptible to cardiovascular disease (CVD).*

- Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland, with 1 in 4 people dying from heart disease or stroke.
- In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due to heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases.

*Cardiovascular disease, as well as causing death, has serious health consequences.*

- Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes.
- The personal burden of heart failure is great, with patients experiencing high levels of physical, functional and emotional distress. Life expectancy for patients with chronic heart failure has been shown to be poorer than for most of the common cancers.

*Preventing CVD can be extremely easy.*

- Maintaining a healthy body weight, eating healthily, taking part in physical activity, reducing salt intake, refraining from or quitting smoking and consuming alcohol responsibly can all significantly reduce the chance of getting cardiovascular disease.

*There are many things you can do to protect yourself against cardiovascular disease.*

- You can control your risk of heart disease by following a heart-healthy lifestyle through maintaining the following five healthy lifestyle habits:
  1. Eating a healthy diet
  2. Being physically active
  3. Limiting your alcohol intake
  4. No smoking
  5. Managing and coping with stress
Please read and consider the following health information about cardiovascular disease:

Men and women over the age of 60 years are susceptible to cardiovascular disease (CVD).

- Cardiovascular disease (CVD), which includes stroke and heart diseases such as heart attacks, is the single largest cause of death in Ireland, with 1 in 4 people dying from heart disease or stroke.
- In 2008, cardiovascular disease accounted for 9,883 (35%) of all deaths. Of these, 5,188 were due to heart disease, 2,116 due to stroke and 2,579 due to other cardiac-related diseases.

Cardiovascular disease, as well as causing death, has serious health consequences.

- Risk factors for cardiovascular disease include lifestyle factors such as unhealthy eating, smoking, drinking alcohol, and physical inactivity, as well as high blood pressure, high blood cholesterol, and diabetes.
- The personal burden of heart failure is great, with patients experiencing high levels of physical, functional and emotional distress. Life expectancy for patients with chronic heart failure has been shown to be poorer than for most of the common cancers.

Preventing CVD can be extremely easy.

- Maintaining a healthy body weight, eating healthily, taking part in physical activity, reducing salt intake, refraining from or quitting smoking and consuming alcohol responsibly can all significantly reduce the chance of getting cardiovascular disease.
- Many of the deaths caused by cardiovascular disease were premature because those people were not aware they had heart disease, which could have been identified early and learned to manage well over time. Past research has found that 90% of heart disease cases are completely preventable by modifying diet and lifestyle factors.

There are many things you can do to protect yourself against cardiovascular disease.

- You can control your risk of heart disease by following a heart-healthy lifestyle through maintaining the following five healthy lifestyle habits:
  1. Eating a healthy diet
  2. Being physically active
  3. Limiting your alcohol intake
  4. No smoking
  5. Managing and coping with stress

- No matter what your age, you can take matters into your own hands to help reduce your risk of cardiovascular disease. You’re never too young – or too old – to take care of your heart. Even small, basic steps based on the five healthy lifestyle habits above can go a long way toward reducing your risk of heart disease.
Appendix T: Study Recruitment Poster (Study 3)

Research Participants Needed

Make a positive contribution to research and science by volunteering to take part in a health research study in the School of Psychology in Trinity College Dublin.

We are currently seeking male and female participants over the age of 60 to take part in a study examining decision-making and health.

The study can be completed online or in person, and will take approx. 25mins to complete.

For more information, please contact Sinéad:

Email: moyletts@tcd.ie  Telephone: 083 8342455

Survey link:

School of Psychology, Áras an Phiaráide, Trinity College Dublin, College Green, Dublin 2.
Appendix U: Additional Negative Emotional Reaction Measures (Study 3)

14. **How much did this message make you feel frightened?**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

15. **How much did this message make you feel nervous?**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

16. **How much did this message make you feel anxious?**

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
### Table V.1

**Descriptive statistics for individual items from the RBD threat measures**

<table>
<thead>
<tr>
<th>RBD Scale: CVD Threat Measures</th>
<th>Standard ((n = 44))</th>
<th>Low Efficacy ((n = 34))</th>
<th>Low Threat ((n = 44))</th>
<th>High Efficacy ((n = 38))</th>
<th>High Threat ((n = 34))</th>
<th>Overload ((n = 45))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptibility 1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal risk</td>
<td>4.82 (1.63; 4.32, 5.32)</td>
<td>4.87 (2.22; 4.10, 5.64)</td>
<td>4.46 (1.70; 3.95, 4.98)</td>
<td>5.21 (1.70; 4.65, 5.77)</td>
<td>5.09 (1.90; 4.43, 5.75)</td>
<td>4.80 (1.60; 4.32, 5.28)</td>
</tr>
<tr>
<td>Susceptibility 2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal susceptibility</td>
<td>4.70 (1.46; 4.35, 5.14)</td>
<td>4.35 (2.27; 3.56, 5.14)</td>
<td>4.07 (1.90; 3.49, 4.65)</td>
<td>4.53 (1.86; 3.92, 5.14)</td>
<td>4.74 (1.90; 4.07, 5.40)</td>
<td>4.07 (1.76; 3.54, 4.60)</td>
</tr>
<tr>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
<td>Mdn (IQR)</td>
</tr>
<tr>
<td>Severity 1: Harmful</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (6.75 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
</tr>
<tr>
<td>Severity 2:</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (6.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
<td>7.00 (7.00 – 7.00)</td>
</tr>
<tr>
<td>Personal severity</td>
<td>6.00 (6.00 – 7.00)</td>
<td>6.00 (6.00 – 7.00)</td>
<td>6.00 (6.00 – 7.00)</td>
<td>6.00 (7.00 – 7.00)</td>
<td>6.00 (7.00 – 7.00)</td>
<td>6.00 (7.00 – 7.00)</td>
</tr>
</tbody>
</table>

\(^a\)Interquartile range
Table V.2

Descriptive statistics for individual items from the RBD efficacy measures

<table>
<thead>
<tr>
<th>RBD Scale: CVD Threat Measures</th>
<th>Standard</th>
<th>Low Efficacy</th>
<th>Low Threat</th>
<th>High Efficacy</th>
<th>High Threat</th>
<th>Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD; 95% CI)</td>
<td>M (SD: 95% CI)</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy 1 (I am able…)</td>
<td>n = 43</td>
<td>n = 32</td>
<td>n = 43</td>
<td>n = 38</td>
<td>n = 34</td>
<td>n = 44</td>
</tr>
<tr>
<td></td>
<td>6.19 (1.48; 5.73, 6.64)</td>
<td>6.59 (1.04; 6.22, 6.97)</td>
<td>6.37 (1.07; 6.04, 6.70)</td>
<td>6.37 (1.43; 5.90, 6.84)</td>
<td>6.26 (1.60; 5.71, 6.82)</td>
<td>6.00 (1.41; 5.57, 6.43)</td>
</tr>
<tr>
<td>Self-efficacy 2 (It is easy to…)</td>
<td>3.00 (2.01; 3.33 (2.14; 3.45 (2.08; 3.15 (2.46; 3.30 (1.97; 3.00 (2.46; 3.30 (1.97;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.22, 3.13)</td>
<td>2.19, 3.23)</td>
<td>3.25, 3.41)</td>
<td>3.15, 3.45)</td>
<td>3.10, 3.45)</td>
<td>3.00, 3.45)</td>
</tr>
<tr>
<td><strong>Eating Healthily</strong></td>
<td>n = 39</td>
<td>n = 31</td>
<td>n = 38</td>
<td>n = 33</td>
<td>n = 33</td>
<td>n = 33</td>
</tr>
<tr>
<td>Response efficacy 1 (prevents)</td>
<td>7.00 (6.00–7.00)</td>
<td>6.00 (4.00–7.00)</td>
<td>5.00 (4.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
</tr>
<tr>
<td>Response efficacy 2 (deters)</td>
<td>7.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Self-efficacy 1 (I am able…)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (5.50–7.00)</td>
</tr>
<tr>
<td>Self-efficacy 2 (It is easy to…)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy 1 (prevents)</td>
<td>n = 39</td>
<td>n = 31</td>
<td>n = 41</td>
<td>n = 38</td>
<td>n = 33</td>
<td>n = 45</td>
</tr>
<tr>
<td>Response efficacy 2 (deters)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
</tr>
<tr>
<td>Self-efficacy 1 (I am able…)</td>
<td>7.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>6.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
<td>7.00 (6.00–7.00)</td>
</tr>
<tr>
<td>Self-efficacy 2 (It is easy to…)</td>
<td>6.00 (6.00–7.00)</td>
<td>5.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
<td>6.00 (5.00–7.00)</td>
</tr>
</tbody>
</table>

*Interquartile Range*
Appendix W: Chi-square Analyses (Study 3)

A chi-square test was carried out to see if there was an association between the EPPM threat-to-efficacy CVD messages and danger/fear-control processes in terms of smoking. No significant association was found between the EPPM threat-to-efficacy ratio CVD messages and whether participants were partaking in danger- or fear-control processes, $\chi^2 (5, 234) = 3.46, p = .629$. See Table W.1 for breakdown of participants per group.

Table W.1

<table>
<thead>
<tr>
<th>Control Processes (Smoking)</th>
<th>Danger-control</th>
<th>Fear-control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPPM Threat-to-Efficacy CVD Risk Message</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard (1/1 Ratio)</td>
<td>19 (8.1%)</td>
<td>24 (10.3%)</td>
<td>43 (18.4%)</td>
</tr>
<tr>
<td>Low Efficacy (1/0 Ratio)</td>
<td>17 (7.3%)</td>
<td>15 (6.4%)</td>
<td>32 (13.7%)</td>
</tr>
<tr>
<td>Low Threat (0/1 Ratio)</td>
<td>26 (11.1%)</td>
<td>17 (7.3%)</td>
<td>43 (18.4%)</td>
</tr>
<tr>
<td>High Efficacy (1/2 Ratio)</td>
<td>18 (7.7%)</td>
<td>20 (8.5%)</td>
<td>38 (16.2%)</td>
</tr>
<tr>
<td>High Threat (2/1 Ratio)</td>
<td>19 (8.1%)</td>
<td>15 (6.4%)</td>
<td>34 (14.5%)</td>
</tr>
<tr>
<td>Overload (2/2 Ratio)</td>
<td>20 (8.5%)</td>
<td>24 (10.3%)</td>
<td>44 (18.8%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>119 (50.9%)</strong></td>
<td><strong>115 (49.1%)</strong></td>
<td><strong>234 (100%)</strong></td>
</tr>
</tbody>
</table>

A chi-square test was carried out to see if there was an association between the EPPM threat-to-efficacy CVD messages and danger/fear-control processes in terms of eating healthily. No significant association was found between the EPPM threat-to-efficacy ratio CVD messages and whether participants were partaking in danger- or fear-control processes, $\chi^2 (5, 229) = 5.48, p = .361$. See table W.2 for breakdown of participants per group. Furthermore, a chi-square test was carried out to see if there was an association between the EPPM threat-to-efficacy CVD messages and danger/fear-control processes in terms of physical activity. No significant association was found between the EPPM threat-to-efficacy ratio CVD messages and whether participants were partaking in danger- or fear-control processes, $\chi^2 (5, 227) = 2.53, p = .772$. See table W.3 for breakdown of participants per group.
Table W.2

Number and percentage breakdown between groups for CVD risk information and control processes.

<table>
<thead>
<tr>
<th>EPPM Threat-to-Efficacy CVD Risk Message</th>
<th>Control processes (Eating healthily)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Danger-control</td>
<td>Fear-control</td>
<td>Total</td>
</tr>
<tr>
<td>Standard (1/1 Ratio)</td>
<td>22 (9.6%)</td>
<td>17 (7.4%)</td>
<td>39 (17%)</td>
</tr>
<tr>
<td>Low Efficacy (1/0 Ratio)</td>
<td>17 (7.4%)</td>
<td>14 (6.1%)</td>
<td>31 (13.5%)</td>
</tr>
<tr>
<td>Low Threat (0/1 Ratio)</td>
<td>25 (10.9%)</td>
<td>18 (7.9%)</td>
<td>43 (18.8%)</td>
</tr>
<tr>
<td>High Efficacy (1/2 Ratio)</td>
<td>19 (8.3%)</td>
<td>19 (8.3%)</td>
<td>38 (16.6%)</td>
</tr>
<tr>
<td>High Threat (2/1 Ratio)</td>
<td>20 (8.7%)</td>
<td>13 (5.7%)</td>
<td>33 (14.4%)</td>
</tr>
<tr>
<td>Overload (2/2 Ratio)</td>
<td>33 (14.4%)</td>
<td>12 (5.2%)</td>
<td>45 (19.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>136 (59.4%)</td>
<td>93 (40.6%)</td>
<td>229 (100%)</td>
</tr>
</tbody>
</table>

Table W.3

Number and percentage breakdown between groups for CVD risk information and control processes.

<table>
<thead>
<tr>
<th>EPPM Threat-to-Efficacy CVD Risk Message</th>
<th>Control processes (Physical Activity)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Danger-control</td>
<td>Fear-control</td>
<td>Total</td>
</tr>
<tr>
<td>Standard (1/1 Ratio)</td>
<td>29 (12.8%)</td>
<td>10 (4.4%)</td>
<td>39 (17.2%)</td>
</tr>
<tr>
<td>Low Efficacy (1/0 Ratio)</td>
<td>18 (7.9%)</td>
<td>13 (5.7%)</td>
<td>31 (13.7%)</td>
</tr>
<tr>
<td>Low Threat (0/1 Ratio)</td>
<td>26 (11.5%)</td>
<td>15 (6.6%)</td>
<td>41 (18.1%)</td>
</tr>
<tr>
<td>High Efficacy (1/2 Ratio)</td>
<td>24 (10.6%)</td>
<td>14 (6.2%)</td>
<td>38 (16.7%)</td>
</tr>
<tr>
<td>High Threat (2/1 Ratio)</td>
<td>20 (8.8%)</td>
<td>13 (5.7%)</td>
<td>33 (14.5%)</td>
</tr>
<tr>
<td>Overload (2/2 Ratio)</td>
<td>28 (12.3%)</td>
<td>17 (7.5%)</td>
<td>45 (19.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>145 (63.9%)</td>
<td>82 (36.1%)</td>
<td>227 (100%)</td>
</tr>
</tbody>
</table>
Appendix X: Additional Analyses (Study 3)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>One-way Between-groups ANOVAs</th>
<th>Kruskal-Wallis Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CVD</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived severity</td>
<td>$F = 1.70, p = .136$</td>
<td></td>
</tr>
<tr>
<td>Social comparison risk$^a$</td>
<td>$F = 0.38, p = .863$</td>
<td></td>
</tr>
<tr>
<td>Social comparison severity</td>
<td>$F = 0.17, p = .975$</td>
<td></td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>$F = 0.42, p = .835$</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy$^a$</td>
<td>$F = 1.23, p = .296$</td>
<td></td>
</tr>
<tr>
<td><strong>Eating Healthily</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>$F = 1.69, p = .137$</td>
<td></td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>$F = 1.24, p = .290$</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>$F = 0.92, p = .472$</td>
<td></td>
</tr>
<tr>
<td><strong>Message Derogation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exaggerated information</td>
<td>$F = 0.90, p = .482$</td>
<td></td>
</tr>
<tr>
<td>Tried to strain the truth</td>
<td>$F = 1.78, p = .118$</td>
<td></td>
</tr>
<tr>
<td><strong>CVD</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>$F = 2.36, p &lt; .05$</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioural intentions$^a$</td>
<td>$F = 6.74, p &lt; .001$</td>
<td></td>
</tr>
<tr>
<td>Behavioural likelihood$^a$</td>
<td>$F = 7.19, p &lt; .001$</td>
<td></td>
</tr>
<tr>
<td><strong>Eating Healthily</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response efficacy</td>
<td>$F = 3.91, p &lt; .01$</td>
<td></td>
</tr>
<tr>
<td>Behavioural intentions</td>
<td>$F = 4.63, p &lt; .001$</td>
<td></td>
</tr>
<tr>
<td><strong>Physical Activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioural likelihood</td>
<td>$F = 5.24, p &lt; .001$</td>
<td></td>
</tr>
<tr>
<td><strong>Message Derogation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial reaction to CVD info.$^a$</td>
<td>$F = 2.74, p &lt; .05$</td>
<td></td>
</tr>
<tr>
<td>Manipulation of feelings</td>
<td>$F = 2.25, p = .05$</td>
<td></td>
</tr>
</tbody>
</table>
Appendix Y: Information Sheet for Think Aloud Procedure (Study 3)

You are being invited to take part in a research study being run by the School of Psychology, TCD that aims to investigate decision-making and health information.

What will happen to me if I take part?
If you decide to take part in this study, you will first be asked to complete a questionnaire providing some information about yourself, your lifestyle and your health. You will then be asked to read some health information about cardiovascular disease. You will be asked to read this information aloud and to “think aloud” your thoughts will doing so. After reading the health information, you will be asked to complete a questionnaire relating to your thoughts and feelings towards the health information. You also will be asked to “think aloud” your thoughts about answering the questions – why you are answering the way that you are. The researcher will prompt you if you become quiet with the statement ‘Keep on talking’. These thoughts will be audio recorded and transcribed.

The study is investigating what people think about when they think about and answer questions about cardiovascular disease. There are no right or wrong answers. If at any stage you feel uncomfortable with the health information or any of the questions being asked, you are free to not answer the question or withdraw from the study at any time without giving a reason. Additionally, there will be information provided for health, information and counselling services should you have any questions relating to some of the issues raised in this study. The researchers contact information will also be provided should you have any further questions.

How long will my part in the study last?
The study will take approx. 30mins to complete.

What are my rights if I join the study?
Participation in the study is entirely voluntary and if you agree to participate you have the following rights:

4. The information from this study will be kept strictly confidential and will not be made available to any other people.
5. We will aim to publish our results in scientific journals but any information we have will be completely anonymous and presented as a group.
6. As participation is completely voluntary, you are free to withdraw from the study at any time. You are also free to withdraw your data at the conclusion of your participation should you so wish.
7. Under the Freedom of Information Act you can have access to any information we store about you, if requested.

Sinéad Moylett, Prof. David Hevey
School of Psychology, School of Psychology,
Áras an Phiarsaigh, Áras an Phiarsaigh
Trinity College Dublin, Trinity College Dublin,
083 8342455 01 8962406
moyletts@tcd.ie heveydt@tcd.ie
Appendix Z: Coding Framework (Study 3)

Theory-based Codes
Codes based on constructs from the Extended Parallel Process Model

1. Threat
Subcategories: Personal severity; Personal susceptibility; Comparative susceptibility; Comparative severity; Difficulties
Definitions:
   a. Personal severity: individuals’ thoughts around the magnitude of the threat. Include lack of perceived severity as well.
   b. Personal susceptibility: thoughts on the personal risk of experiencing the threat.
   c. Comparative severity: comparisons or discussions of the magnitude of CVD for others.
   d. Comparative susceptibility: comparisons or discussions of other’s risk of experiencing CVD.
   e. Difficulties: participant discusses the frustrations or difficulties of having CVD, that cannot be coded into any of the subthemes above.
Examples:
   a. Personal severity: “CVD leads to death”; “CVD is harmful”; “I don’t think CVD is a big deal”
   b. Personal susceptibility: “I’m at risk for CVD because I smoke”
   c. Comparative severity: “CVD would be a severe problem for someone else of the same age”
   d. Comparative susceptibility: “Compared to my husband, I’m not going to get CVD”

2. Efficacy
Subcategories: Response efficacy; Self-efficacy
Definitions:
   a. Response efficacy is the belief around the effectiveness of the recommended response in impeding the threat.
   b. Self-efficacy refers to the individual’s belief in their own capability to carry out the recommended response.
Examples:
   a. Response efficacy: “Eating healthily prevents CVD”; “Not smoking will help prevent CVD”; “It’s difficult when your addicted to smoking”
   b. Self-efficacy: “I am able to eat healthily to prevent CVD”; “I am able to not smoke”
3. **Affect**

“Faint whispers of emotion”, and the amount of specific goodness or badness (a) experienced as a feeling state and (b) demarcating a positive or negative quality of a stimulus… usually positive or negative.

*Subcategories*: Positive or negative aspect; Specific emotion

*Definitions:*

a. Positive or negative aspect: Participant makes a general affective responses – doesn’t specify one emotion, but is generally positive or negative
b. Specific emotion: the participant mentions experiencing a specific emotion, such as sadness, anxiety, worry, happiness, helpfulness, etc.

*Examples:*

a. Fear: "I'm afraid of CVD"; "I'm scared of having a heart attack or a stroke"
b. Sadness: "It's sad to see someone in that way"

*Note.* Make sure to code for a lack of affective responses

4. **Fear-control processes**

An emotional process eliciting defensive motivation that occurs when people are faced with a significant and relevant threat but believe themselves to be unable to perform a recommended responses and/or they believe the response to be ineffective. The high levels of fear causes by this conduct produce defensive motivation resulting in coping response that reduce fear and prevent danger control responses from occurring.

*Subcategories*: Defensive avoidance, denial, reactance (e.g., message derogation, perceived manipulative intent), humour and religion.

*Definitions:*

a. Denial: refuse to believe they could experience the health threat
b. Defensive avoidance: blocking further thoughts or feelings about the given health threat
c. Reactance: individual often say the risk message or the source of the risk message is trying to manipulate them (message derogation or perceived manipulative intent)
d. Humour: Using a joke or laughter to avoid dealing with or discussing the health threat
e. Religion: Using religious practices or beliefs to avoid dealing with or discussing the health threat. Also, using religious beliefs to avoid using the recommended responses.

*Examples:*

a. Denial: "I'm not at-risk for getting CVD, it won't happen to me"
b. Defensive avoidance: "This is just too scary, I'm simply not going to think about it"; “I don’t want to think about it”
c. Reactance: "They're just trying to manipulate me, I'm going to ignore them"; “I’m going to ignore the information as it’s been changed”
d. Message derogation: “That information is incorrect”; “The information is wrong”
e. Perceived manipulative intent: “The information has been changed to try and get a reaction”


g. Religion: “I say a rosary, any problem goes away”

5. Danger-control processes
A cognitive process eliciting protection motivation that occurs when one believes s/he is able to effectively avert a significant and relevant threat through self-protective changes. When in danger control, people think of strategies to avert a threat.

Subcategories: Belief, attitude, intention and behaviour changes in accordance with a message’s recommendation; Justification

Definitions: Belief, attitude, intention and behaviour changes that are mentioned in reference to the message about CVD that the participant just received.

a. Beliefs: Participant discusses why they believe a certain activity or practise is effective in dealing with the risk of CVD

b. Justification: Alleviating the risk of CVD by discussing a health behaviour or activity that they take part in (medication for CVD) – they are at a reduce risk because they partake in a health behaviour or take a specific medication.

c. Intention: Participant discusses intents or plans to change an associated health behaviour

Examples:

a. Beliefs: “It made me think about cardiovascular disease”

b. Justification: “Well I drink, but I don’t smoke and my diet is healthy”

c. Intention: “I’m going to exercise so that I reduce my risk”

Context-based Codes

Codes based on constructs that have arisen due to the topics covered in the interview

1. Medical history
References made by participants to their own and other’s history of cardiovascular disease and other disease.

Subcategories: Personal history of CVD; Family or friends history of CVD; Personal medical history (not CVD); Family or friends medical history (not CVD); Difficulties

Definition:

a. Personal history of CVD: General reference to the participant’s own history of cardiovascular disease that cannot be coded into one of the theory-based codes.

b. Family or friend’s history of CVD: General reference to a family member or friend who has a history of cardiovascular disease that cannot be coded into one of the theory-based codes.

c. Personal medical history (not CVD): General reference to the participant’s own medical history of other diseases (not CVD) that cannot be coded into one of the theory-based codes.
d. Family or friends medical history (not CVD): General reference to a family member or friend who has a history of other diseases (not CVD) that cannot be coded into one of the theory-based codes.

e. Difficulties: If the participant refers to any hardships or difficulties with dealing with the disease

**Examples:**

a. Personal history of CVD: “I have an irregular heart beat”; “I had surgery, got 5 stents”

b. Family or friends history of CVD: “My mother died of a stroke”

c. Personal medical history (not CVD): “My husband had colon cancer”

d. Family or friends medical history (not CVD): “I see friends of mine who are getting sick”; “A friend of mine is in and out to the hospital”

e. Difficulties: “That’s the main thing I suppose in my life”; “It’s very hard sorting these things”

2. **Health behaviours or associated risk factors**

General references made by participants to the associated health behaviours and risk factors of cardiovascular disease.

*Subcategories:* Stress; Eating healthily; Smoking; Exercise; Weight; Alcohol; Personality type

*Definition:* General reference to one of the subcategories listed above that cannot be coded into one of the theory-based codes.

**Examples:**

a. Stress: “Stress is the one that gets to me, usually from work”

b. Personality type: “I’m an anxious type of person”

c. Weight: “I had put on, on, on a lot of weight ya know and it was just incrementally over, over the years it just, it built up ya know?”

3. **Health literacy**

The cognitive and social skills, which determine the motivation and ability of individuals to gain access to, understand and use information in ways, which promote and maintain good health.

*Subcategories:* Awareness; Media platforms; Inconsistencies

*Definition:*

a. Awareness: level of knowledge or perception of CVD, the risks associated with such, and the associated health behaviours and risk factors

b. Media platforms: References made by participants to health information on the TV, on the internet, or in any kind of media platform.

c. Inconsistencies: Participant doesn’t mentioned when asked about a history of cardiovascular disease, but then mentions later in the interview about having some aspect of such (e.g., high blood pressure, cholesterol, etc.)

**Examples:**

a. Awareness: “Are we missing the, the, is there, there, is there eh hereditary the, the, factor, factor in, in, in here, in relation to?” [Participant raised the topic
even though it wasn’t mentioned in the CVD message]; “I know about it. I know about it, no I don’t think so” [Speaking about CVD]

b. Media platforms: “I mean everything I’ve seen about this business of cardiovascular disease and how, those various things we talked about can affect it”; “I saw on the TV…”

4. Interview

References made by participants to aspects of the message and the measures included in the questionnaire

Subcategories: Message about cardiovascular disease; Measures included in the questionnaire; Responses given by participants to the measures.

Definition: References made by participants to aspects of the message and the measures included in the questionnaire

a. Uncertainty: If the participant makes any reference to not understanding the message or what is being asked in the measure.

b. Skewed data: Participant refers to responding in the majority on the high (or low) levels of the Likert scale

c. Information seeking: Efforts made by the participant to gain more knowledge

Examples:

a. Uncertainty: “Eating healthily works in deterring cardio. How do you mean works? Prevents? Works?”; “That’s the same question in an another slightly different way of stating it, isn’t it?”

b. Skewed data: “I don’t know why I’m going for the top all the time” [In reference to choosing 7 on all Likert scales]

c. Information seeking: “There was a lecture and I went to the lecture, and the, the, the nurse/dietician was talking about diabetes”